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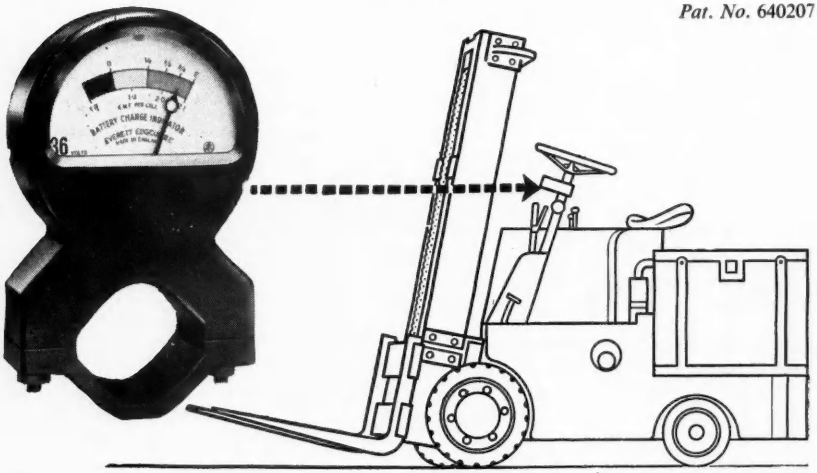

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ELECTRICAL REVIEW

13th MARCH, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 11

Power Station Standards

IN few fields would standardization offer so many apparent advantages as it does in relation to power stations—in reducing capital expenditure, expediting installation and simplifying operation—yet in few does it present so many difficulties or call for so much caution to avoid hampering technical progress. A good beginning was made by specifying the most suitable ratings and associated steam conditions of turbo-alternators. A more ambitious proposal is to adopt the same layout for more than one station, but site conditions and all that this implies usually differ so fundamentally that such a course is unlikely to provide any general solution.

How many and far-reaching are these differences was clearly indicated in the joint I.E.E. and I.Mech.E. paper of Messrs. S. D. Whetman and A. E. Powell (reported in this issue), which aimed tentatively at promoting fuller standardization. The authors seemed not altogether happy about some of the standards that already exist—notably the identity of maximum continuous and most economic ratings of 60 MW sets. They presented a case for the retention of the overload valve—now standard for machines up to 30 MW—a view that occasioned some controversy in the subsequent discussion. Technical questions raised by these and other standardization matters are made vastly more complex by the need to relate them economically to the useful life of the plant, say 25 years. During that period to-day's base load plant will, as newer sets are commissioned, descend to peak duty, while the future price of coal is, of course, all too uncertain. The stations described were well chosen to illustrate evolutionary trends towards feasible standards. The authors stated that they were designed to ensure reliability and highest overall economy rather than to achieve the highest thermal efficiency. These aims have been proved not incompatible, since four of the five stations dealt with have been among the ten most efficient B.E.A. stations, the best results in both

categories having been achieved in the first six months of last year by the station of the most advanced design, Littlebrook "B" (34·4 per cent on kWh sent out and 92·55 per cent availability). In view of the rapidity of technical advances (exemplified by the reduction in the number of boilers in more recent power stations), standardization appears unlikely to be achieved other than by the evolution of "preferred standards," a term that seems to suggest the possibility of evision from time to time.

EXPORT AID

Conditions for British exporters are not becoming easier. After the immediate post-war rush for goods former buyers are becoming more discriminating (often by force of circumstances as well as by choice), competition is increasing and so are currency difficulties. In such conditions exporters have to study their markets and equip themselves with up-to-date knowledge of the many factors which govern export trade to a far greater extent than some of them have hitherto considered necessary. They should therefore welcome and use the Electrical Industry Export Service which has been established under the administration of the B.E.A.M.A., with the recognition of the Board of Trade. This Service is open to large and small manufacturers alike and should prove a valuable aid in increasing exports.

SPANISH WATER POWER

Hydro-electric projects in Spain are designed to meet, in all seasons, a demand which is increasing at a rate comparable with that found in other European countries. The disastrous effects of drought, as in 1945 and 1949, were mitigated by steam stations, but these can give only limited aid to the main hydro-electric works owing to the small coal resources of the country. Regulation by water storage and dams is consequently of exceptional importance. The relatively high rainfall in Galicia and the flow of the River Duero are fortunately reasonably near the centres of industrial consumption and hydro-electric production can probably be expanded more than three-fold ultimately.

DISTRICT HEATING

Misapprehension regarding the extent to which turbine exhaust steam is used in providing public supplies of hot water would probably be avoided if the term "district heating" had not come to be associated with this process. The Whitehall Gardens scheme is legitimately so described in the *Journal* of the Institution of Heating and Ventilating Engineers, but the steam in this case is raised in oil-fired boilers on site. When it is completed the B.Th.U. per hr will be approximately more than five times that at Churchill Gardens, Pimlico, where exhaust steam is obtained from auxiliary turbines in Battersea power station and is believed to be the first installation of its kind.

UNREWARDING EFFORT

In its report for 1952 upon the Monopolies and Restrictive Practices Act the Board of Trade records the activities of the Monopolies Commission, and appends to the report the references to the Commission relating to electrical machinery and plant and the general investigation of "certain practices." What it does not record is the cost of the investigations to those associations and firms upon which the burden of providing evidence falls. Principals and staffs of these bodies, already over-occupied, are called upon to spend too much time meeting the Commission's requirements, to the serious detriment of essential business. The results are very unlikely to be commensurate with the labour involved. To quote Tony Weller: —

> "Vether its worth while goin' through so much to learn so little, as the charity boy said ven he got to the end of the alphabet, is a matter of taste."

Peat Fired Gas Turbine

Machine Successfully Developed by Ruston & Hornsby

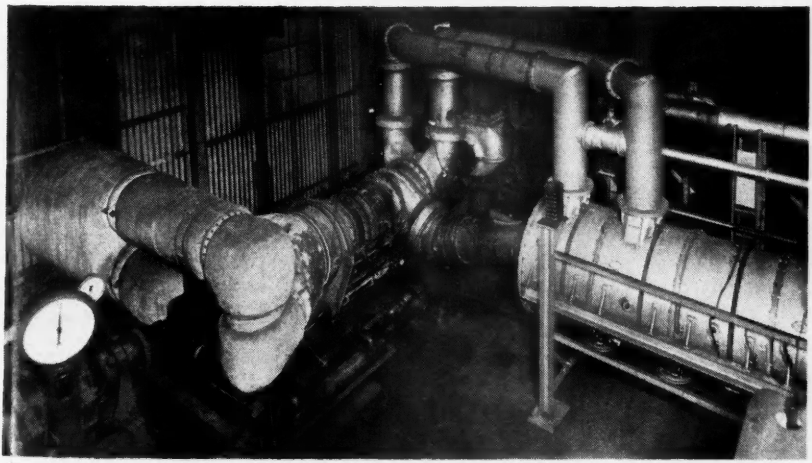
THE idea of using peat as a gas turbine fuel is due to Mr. C. H. Secord, of the Ministry of Fuel and Power, who recognized in 1947 that the waste heat in the exhaust of an open cycle machine could be used for drying the incoming fuel to a sufficiently low moisture content for efficient combustion. Discussions took place with Ruston & Hornsby, Ltd., culminating in the placing of a contract in 1949 for the development of a peat burning gas turbine based upon the company's existing 750 kW design (see *Electrical Review*, 26th August, 1949, pp. 368–370, and 20th January, 1950, pp. 110–112).

After initial testing on oil fuel in 1951, the turbine made its first runs exclusively on peat in 1952. Many problems required solution in this development and the closest co-operation has been maintained throughout with the staff of the Ministry under its chief scientist, Sir Harold Roxbee Cox.

Even when dry, peat is bulky and transport over any distance is expensive. For this reason any peat-operated plant should be near the peat deposits. Where these deposits are large, it is possible to site a fair-sized power station near them, in the knowledge that the station will have an economic life. Large deposits, however, are an exception in Great Britain, so plant of reasonable size could spend only part of its life on any given deposit. It is thus desirable that the plant should be reasonably transportable and not require elaborate foundations and buildings. From this point of view a simple form of open cycle gas turbine is admirable.

Work on the dewatering of peat is being carried out by the Ministry of Fuel and Power in collaboration with the Peat Division of the Department of Agriculture for Scotland. They have been developing the Madruck process by which much of the water can be pressed out of the peat, after a proportion of dry dust has been mixed with it to provide leakage channels. In this way it is possible to remove 5 lb of the 9 lb of water associated with each pound of peat solids; the turbine exhaust will dry off

General view of Ruston peat fired gas turbine showing the running turbine on the left and the combustion chamber on the right



the remaining 4 lb. This process appears to have a big advantage in this country where the seasonal labour necessary for producing peat may be difficult to obtain. The turbine exhaust dryer for this duty is of the rotary louvre type made by Dunford & Elliott (Sheffield), Ltd.

In certain places, however, it may be advantageous to use an air drying process for winning the peat, in which case the thermal drying required would be much less. If the milled peat process, one of the most successful means of air drying, which produces peat having about 1 lb of water to each pound of dry peat, were used, the drying problem would be simple.

A problem which may not be apparent is that of feeding pulverized peat to a combustion chamber against compression pressure. Pressurizing the fuel appears possible in a number of ways but the only methods taken to a practical stage so far are the Lock hopper system and the pulverized fuel pump. Of these, the latter is the most attractive because of its simplicity; running experience has been gained on a rotary pump supplied by the Incandescent Heat Co. It comprises a carrier plate containing a number of pockets which receive fuel at atmospheric pressure at one station and carry it round to another station, where entraining pressure air is admitted which carries the fuel out into the delivery line. The system is complicated in practice, however, by the seals for restricting air and fuel leakage to a low rate, but in this respect the pump appears successful.

Pressurizing the fuel is only a part of the problem. The process of getting pulverized fuel out of a hopper and metering it sufficiently closely for a gas turbine, proved to be a serious obstacle. The flow of solids in a hopper is localized to a vertical zone above the outlet, and this downward moving column should be replenished by an inward flow at the upper surface. Stoppage of flow can result from failure of the inward flow giving a result termed "coring." Sometimes inward flow takes place at a level lower than the upper surface, leaving peat above in the form of a dome (see Fig. 1). The angle of repose of pulverized fuels varies considerably with settling period, and this, combined with the hygroscopic and fibrous nature of peat, makes it a difficult material to handle. A satisfactory solution is to keep the peat in a fluidized state by percolating air through it.

In the process of fluidization, particles of solids are maintained in suspension in a moving air stream. A drag is thus produced on them equal and opposite to their weight, and the required air velocity is equal to their free falling speed. For pulverized peat particles the balance between weight and drag occurs at low Reynolds numbers which are roughly within the range covered by Stokes' Law. In a fluidized peat bed, however, there is a wide range of particle sizes giving rise to inter-particle interference and friction between the solids and the wall of the column. In spite of this, fluidization is possible, and provided the range of particle size is not too wide, there is a minimum air velocity which will produce fluidization, the properties of the resulting solids-gas mixture being similar in many respects to those of a liquid. The critical fluidizing velocity of the pulverized peat used in the turbine is 4 cm/sec. The

Fig. 1.—Flow failure in a conical hopper

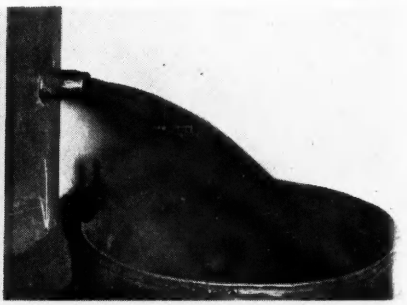


Fig. 2.—Flow of fluidized peat

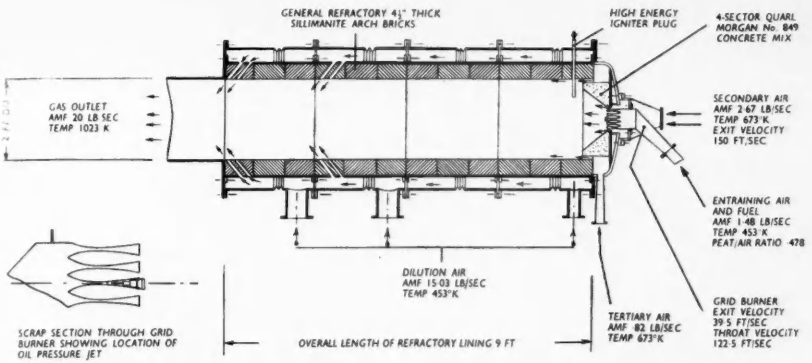

GENERAL REFRACTORY 4½" THICK SILLIMANITE ARCH BRICKS
HIGH ENERGY IGNITER PLUG
4-SECTOR QUARL MORGAN No. 849 CONCRETE MIX
GAS OUTLET AMF 20 LB SEC TEMP 1023 K
SECONDARY AIR AMF 2·67 LB/SEC TEMP 673°K EXIT VELOCITY 150 FT/SEC
ENTRAINING AIR AND FUEL AMF 1·48 LB/SEC TEMP 453°K PEAT/AIR RATIO 478
DILUTION AIR AMF 15·03 LB/SEC TEMP 453°K
TERTIARY AIR AMF 82 LB/SEC TEMP 673°K
GRID BURNER EXIT VELOCITY 39·5 FT/SEC THROAT VELOCITY 122·5 FT/SEC
SCRAP SECTION THROUGH GRID BURNER SHOWING LOCATION OF OIL PRESSURE JET
OVERALL LENGTH OF REFRACTORY LINING 9 FT

Fig. 3.—Peat fired combustion chamber together with grid type burner, the design being based on information from the Fuel Research Station

fineness of the peat is such that 55 per cent will pass through a 200 mesh B.S. screen and 7 per cent is caught on a 60 mesh screen.

The success of fluidization depends, largely, on the fine division and uniform distribution of the fluidizing air. After much experiment, a method was developed using an underbed of No. 16 steel shot, although for small scale work, sintered stainless steel and porous ceramic discs were used. A study was made of the effects of solids static head, and fluidizing air density and viscosity, on the critical fluidizing velocity. In the range of pressures from one to three atmospheres, and at temperatures from ambient to 200 deg C, the critical fluidizing velocity is independent of the three variables. Theoretically, it is inversely proportional to the absolute viscosity but since the air temperature rapidly drops to that of the peat, viscosity effects are almost eliminated. The flow of fluidized peat from a column such as in Fig. 2 is almost directly proportional to the solids static head, and to the area of the outlet orifice.

A pressurized fluidizing column having an effective capacity of 1,000 lb of peat was tested in conjunction with the peat fired turbine. Engine control was maintained manually by metering the fluidized peat, using a ¾in fullway gate valve, and results indicate that the fluidized feeder meets the special requirements of the open cycle gas turbine.

The combustion chamber design largely depends on the moisture content of the peat at entry to the chamber, and on the fineness to which the peat has been ground. Little information is yet available upon the combined effect of moisture content and fineness on the combustion of peat, and at present the fineness provided by a commercial grinder gives an acceptable quality of combustion with up to 35 per cent moisture content peat. While drying and grinding are vital characteristics of peat, its chemical properties are also of importance. It has a high volatile and low fixed carbon content leading to a rapid temperature rise in the primary combustion zone. It also has a relatively low ash content, which, combined with the other factors, led to the choice of a refractory lined non-slagging type of chamber. The basic design, together with a grid type burner, was based on information from the Fuel Research Station, where a system has been developed to burn coal at atmospheric pressure (see Fig. 3), and on which some preliminary peat combustion tests were carried out.

It is desirable with solid fuels to radiate heat rather than convect it into the ignition zone, so a refractory quarl is used. For starting purposes the refractories are heated up by a pilot oil burner, following which peat, together with "entraining" or "primary air," is admitted to the chamber and ignition can be completed within an inch or two of the grid burner nozzles. Once ignition of the peat has been established, which would be at a refractory temperature of about 800 deg C, the pilot oil burner is shut off. It is eventually hoped to correlate the ignition characteristics in a combustion chamber with inflammability

as measured by Godbert's apparatus for varying degrees of fineness and moisture.

Following ignition, the combustion of volatiles takes place immediately and further air ("secondary") is required. This enters between the fuel nozzles of the burner, and the rate of mixing is controlled by adjusting the relative velocities of the primary and secondary air supplies. The secondary air is pre-heated to about 400 deg C to avoid chilling the combustion process. To prevent elevated refractory temperatures, a tertiary air feed is provided near the wall and this in addition forms a further source of combustion air. Refractory temperatures of 1,000 deg C are normal practice using Silimanite bricks containing about 63 per cent alumina. The optimum quantity of primary, secondary and tertiary combustion air is about 120 per cent of that theoretically necessary for complete combustion but this depends on the volatile content of the fuel. Calculations show that for 30 per cent wet peat, the temperature rise due to burning the volatiles is then about 800 deg C, and it has also been found that the velocities through the burner can be higher for finer and drier peat due to its ease of ignition and higher rate of burning.

Combustion of the fixed carbon is slow and large scale turbulence plays little part. The controlling factors are particle size, residence time and temperature. The advantage of a refractory lined chamber in maintaining a high temperature throughout its entire length is, therefore, evident. A 75 micron particle of peat (200 mesh) requires a residence time of about 90 millisec to burn, which, using an average gas velocity of 50 ft/sec, represents a distance of 4½ft. This agrees with experimental results. A compromise is required, however, and with commercial grinding techniques, fuel which passes 55 per cent through a 200 mesh screen is used. A combustion efficiency of 95 per cent can be attained and the loss is due almost entirely to the few largest particles which would require an extremely long residence time to burn completely. Dilution down to turbine inlet temperature is carried out at the downstream end of the combustion chamber through 1in diameter ports.

The combustion intensity of the chamber as a whole is low compared with an industrial gas turbine oil-fired chamber, being about $1{\cdot}3 \times 10^5$ C.H.U./cu ft/hr/atmosphere but high compared with boiler practice. The volatiles which account for half of the heat release, burn in the primary zone with an intensity of about $6{\cdot}0 \times 10^5$ C.H.U./cu ft/hr/atmosphere. Since the residence time and temperature are high, the loss of combustion efficiency in gaseous products is negligible in this type of chamber. Provided

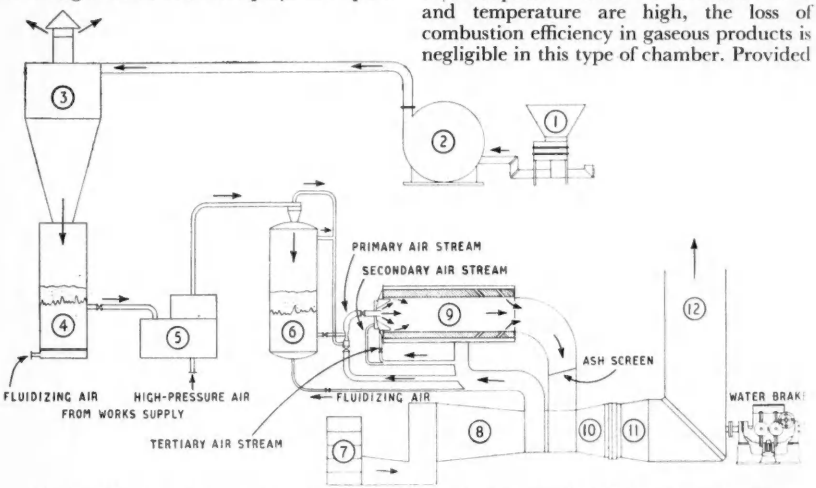


Fig. 4.—Diagrammatic arrangement of peat fired gas turbine. 1. Peat feeder. 2.—Atritor for grinding peat. 3.—Peat separating cyclone. 4.—Low pressure fluidizing column (6in water gauge). 5.—Peat pump. 6.—High pressure fluidizing column (4 atmospheres absolute). 7.—Air intake filters. 8.—Compressor (11,800 r.p.m., ratio 4 : 1). 9.—Combustion chamber (4 atmospheres absolute, 727 deg C). 10.—Compressor turbine. 11.—Power turbine (6,000 r.p.m.). 12.—Exhaust (471 deg C, 1·06 atmospheres absolute)

the ash content of the fuel is known, sampling of the exhaust solids gives the complete picture. With typical peat, about 60 per cent combustible matter in the exhaust indicates a loss of combustion efficiency of 10 per cent.

Tests have shown the grid burner to be flexible in operation and with fairly dry peat up to 240 per cent of the stoichiometric quantity of air has been introduced for combustion. This should permit part load running on the engine down to about 20 per cent, using peat only. Engine tests are now taking place and the performance to date is satisfactory.

Compared with most solid fuels peat does not contain much ash (about 2 per cent). The gas turbine in its present form contains only a rudimentary ash separator—a screen with $\frac{3}{16}$in gaps. The plant has been assembled in this form with the expectation of some blade erosion and deposits. This step has been done to obtain quickly an idea of the magnitude and nature of the erosion problem to be solved, as it is anticipated that a very long period of running will be possible before an appreciable amount of erosion occurs when an effective ash separator is fitted.

Once the wear on the turbine blades has become appreciable, a cyclone separator will be inserted between the combustion chamber and the h.p. turbine. This cyclone has been designed after the principles, and with the collaboration, of Professor ter Linden of Delft and should be able to separate out most of those larger particles of ash (greater than 20 micron) which are likely to erode the turbine blades. Provision has been made for sampling the ash going to the turbine, and an air elutriator has been constructed in order to obtain the size spectrum of the ash.

A diagrammatic arrangement of the plant as it is at present is depicted in Fig. 4, and a perspective view is shown in Fig. 5. Air enters through the Vokes filters; in the compressor its pressure is raised to four atmospheres absolute, and from thence it goes to the combustion chamber. The air from the compressor is divided into several streams, one of which flows as fluidizing air to the bottom of the high pressure fluidized column. Another is the primary air line carrying the peat into the combustion chamber. Other streams supply the secondary and tertiary air to the upstream end of the combustion chamber. Most of the air, however, is dilution air which enters at the downstream end of the combustion chamber. The hot gases pass through the screen which has already been mentioned

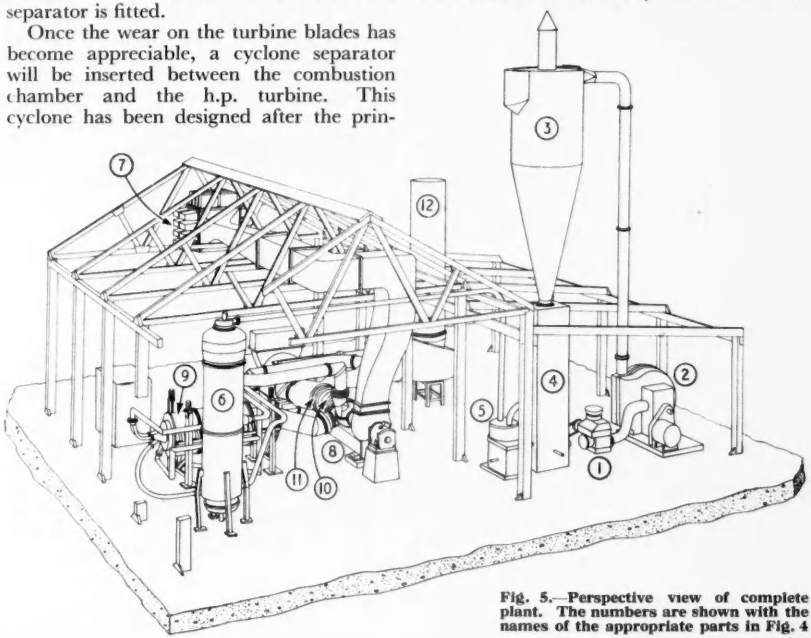


Fig. 5.—Perspective view of complete plant. The numbers are shown with the names of the appropriate parts in Fig. 4

and enter first the h.p. turbine, then the l.p. turbine and finally pass to the exhaust.

Peat enters the system at the peat feeder, whence it is fed to the Atritor grinder. After grinding, a cyclone separates the peat dust from the carrying air stream, and discharges it into the low pressure fluidized column. It then flows into the peat pump which transfers it into the h.p. air stream carrying it into the h.p. fluidized column. The h.p. stream of air from the peat pump is provided from the works mains. The engine is controlled manually from the 0·75in fullway gate valve at the bottom of the peat pump fluidizing column.

When the plant has been developed to a satisfactory degree it will be taken to a peat bog in Scotland, to join the Dunford & Elliott dryer and the dewatering press being made by John Shaw & Sons (Salford), Ltd. It will then be run for a long period to determine the best method of operation and to ascertain precisely the running economics of such an installation.

In the event of an open cycle gas turbine being run in conjunction with the milled peat process, there are two possibilities; one is to use the exhaust gas heat to dry more peat than is required by the turbine itself, this dry peat then being briquetted and sold as a domestic fuel. Alternatively, a more complex gas turbine cycle could be used involving intercooled compression to raise the thermal efficiency.

The work on peat has also shown a way to the use of other solid fuels and the possibilities are now being investigated of using similar plants for generating power from waste wood from sawmills, brown coal, and other combustible vegetable products.

RECENT BRITISH STANDARDS

AMONG specifications recently published by the British Standards Institution are the following, copies of which are obtainable at the prices stated from the British Standards Institution, 24, Victoria Street, London, S.W.1.

DIMENSIONS OF LIGHTING FITTINGS.—B.S. 364 : 1953 (price 2s 6d) for neck and flange dimensions of lighting fittings, which first appeared twenty-four years ago, was revised nineteen years ago and has now been extended to cover openings in shades and reflectors for both electric and gas fittings, covering also the neck and lug dimensions of bayonet pattern globes, shades and galleries and re-worded to include globes, shades and similar parts made of glass and other materials. Explanatory diagrams and tables of dimensions are included, the latter having regard for dimensions mentioned in B.S. 884–161–52.

REFLECTORS FOR MERCURY LAMPS.—B.S. 1950 (price 2s) for vitreous enamelled steel reflectors for mercury electric discharge lamps is based on B.S. 232, but now covers four sizes of the open dispersive type classified in B.S. 298 as Class A (III) direct intermediate.

SHEET AND STRIP COPPER.—B.S. 1432 (price 4s) for sheet and strip copper for electrical purposes has been revised principally for the inclusion of two diagrams of recommended sizes for transformer windings and for those of rotating machines.

INTERFERENCE SUPPRESSION.—B.S. 833 (price 3s) for radio interference suppression (cars, boats and machines incorporating internal combustion engines) is a revision of the 1939 edition. The maximum permissible magnitude of interference-producing electric fields is now specified, this limitation being of particular interest in view of the W/T (Control) Regulations of 1952.

INDICATOR LAMPS.—B.S. 1050 (price 2s 6d) for visual indicator lamps has also been revised mainly for revising certain ratings and, for the first time, including figures for carbon filament lamps; certain definitions have been amended and the method of batch sampling and testing has been simplified.

ASBESTOS INSULATING TAPE.—B.S. 1944 (price 2s 6d) for woven asbestos insulating tape, plain unimpregnated with selvedges, is, like B.S. 1720, based on E.R.A. information and similarly does not cover tapes which have an all-cotton warp or weft.

PROJECTORS.—B.S. 1915 (price 3s) for projectors of 35 mm film strip, miniature lantern slides and for educational optical lanterns will ensure dimensional compliance with the requirements of B.S. 1917, which is in preparation.

COLOUR TERMS.—B.S. 1611 (price 3s 6d) is a glossary of colour terms used in science and industry, many of them agreeing with international definitions, but it does not attempt to define all colour terms used in everyday speech.

AIRCRAFT INSTRUMENTS.—B.S. G. 141 (price 1s) for flexibly mounted instrument panels for fixed wing aircraft deals with the avoidance of vibration. B.S. G. 143 (price 2s 6d) for d.c. linear and rotary actuators for aircraft specifies the design and test procedure of two types distinguishable by voltage range.

Post Insulators for 275 kV Grid

THE first consignment of the largest post insulators so far made in this country is being delivered this month for installation at Staythorpe on the 275 kV super-grid as insulators for isolating switches and busbar supports. They have passed complete type and sample tests at the Stourport, Worcestershire, works of Steatite & Porcelain Products, Ltd., which is a subsidiary of the Metals Division of Imperial Chemical Industries, Ltd., and were designed to meet the requirements of the British Electricity Authority, its consultants and the British switchgear makers, representatives of all of whom witnessed the tests.

These post insulators are made up of eight units and have an overall height of 9ft 8in, the dimensions being similar to those of the post insulators used in the United States on the Boulder Dam 287 kV system, but they are of greater mechanical strength and the porcelains have been specially designed to ensure trouble-free operation in British fog and smoke.

The minimum cantilever strength of the British insulators is specified as 2,000 lb, to obtain which the three more highly stressed units of each post are of heavier construction than the other five. In a few positions, underhung posts are to be used and as the loading of the latter will be lower all eight units will be of the smaller size.

Table 1—Tests on 275 kV Post Insulators with Grading Rings

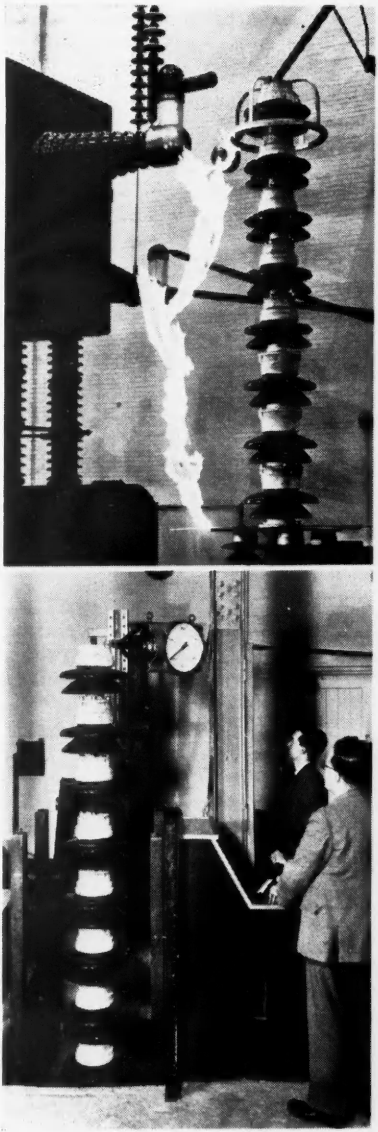
	kV Specified	kV Measured
Impulse withstand	1,050	1,050
Dry flashover, main	580	702*
Dry flashover, underhung ..	580	756*
Wet withstand	460	460
Wet flashover, main	520	614*
Wet flashover, underhung ..	520	563*
Corona	191	191

* Average of measurements on three posts.

Table 2—Cantilever Strength of 275 kV Post Insulators

	Specified lb	Measured lb
Main post (upright)	2,000	2,160*
Underhung post (inverted) ..	1,200	1,550*

* Average of measurements on three posts.



One of the 275 kV post insulators flashing over at 705 kV in the makers' works, showing part of the million volt testing transformer to the left. In the lower photograph a super-grid post insulator is shown undergoing cantilever strength test in makers' laboratory

Since the 275 kV grid is to be "effectively" earthed, a comparatively low insulation level was specified, but the insulators were not designed down to that level and during the type tests it was shown that a considerable margin exists between the specified and the actual flashover values. The insulators are fitted with deep grading rings to avoid corona, which is liable to cause radio interference. The flashover tests were applied to insulators fitted with grading rings and, although they reduced the sparking distance, the flashover voltages were well above the specified figures (see Table 1); without the grading rings the flashover voltages were about 850 kV when dry and about 750 kV when wet.

In addition, three posts of each type were tested under cantilever loads to determine their rigidity and ultimate strength. Table 2 gives the ultimate strengths measured in the official type tests.

While the type tests were in progress sample tests were also carried out. To cover the different units to be used in the main and the underhung posts, twelve units in all were subjected to the full series of special tests called for by the B.E.A. specification; they included temperature cycle, cantilever, tensile, torsional and electrical puncture tests.

In the high-voltage laboratory of Steatite & Porcelain Products, Ltd., are transformers for power frequency tests at up to 1,000,000 V (r.m.s.) and it is one of the few laboratories in Britain where it is possible to carry out dry and wet flashover tests of this kind of insulator, but much of the apparatus needed for the extensive mechanical tests had to be specially constructed because of the size and strength of the insulators.

A number of these big post insulators have already been supplied to switchgear makers to enable them to develop their isolating switches, while a post is also on test at the insulator testing laboratory of the B.E.A. to study its performance under conditions of heavy industrial pollution.

Microporous Thermoplastic

Application in Manufacture of Battery Separators

A MICROPOROUS thermoplastic material, known by the registered trade name "Porvic," has been developed and is now being made in quantity by Pritchett & Gold and E.P.S. Co., Ltd. The material is primarily intended for making battery separators and consists of porous unplasticized polyvinyl chloride. The "Porvic" battery separator usually takes the form of a sheet about 0·03in thick, with narrow vertical ribs which bring the overall thickness to the distance between the plates.

"Porvic," unlike the wood traditionally employed, is totally unaffected by the battery acid or the chemical reactions. Furthermore, a closer assembly is possible which lowers the internal resistance of the battery and thus improves performance. The separator can be in the form of a complete envelope which proteets the edges of the plates.

The new material is entirely British in origin and the production processes are patented throughout the world. The porosity is obtained by mixing into the plastic material a uniformly fine powder which is subsequently removed. A third ingredient, a solvent for the plastic, facilitates mixing the ingredients and fabricating the separators or other diaphragms, and is removed by the application of heat, leaving an intimate mixture of plastic and pore-forming ingredient. Chemical extraction of the pore-forming ingredient then leaves the plastic in the microporous form.

The structure consists essentially of a system of uniform spherical cells, each having openings into neighbouring cells. In standard grade "Porvic" the diameter is 0·015mm, while the openings into adjacent cells are of the order of 0·001mm. Combined with a volume porosity of 85 per cent, the structure of the material gives it unique properties as a porous medium, capable of holding back particles larger than 0·001mm in diameter, while allowing free passage of gases and liquids. Any particles which are too large to pass through are held up on the surface.

The material, with its excellent chemical stability, has important uses outside the battery field. The basic properties of volume porosity, pore size, permeability and retention can be controlled and varied to suit specific applications, a number of which are at present under development, including filtration, aeration, electrolysis and aerodynamic research.

Engineering in Europe

Survey of Current Literature

THE chief designer of one of the leading European firms of transformer manufacturers (A.C.E.C.) presents his views upon and experience with the shell form-fit type of transformers, pointing out the essential advantages of this design over the old shell-type transformer, provided that the characteristics and constructive requirements of the new type are correctly conceived by the designer. Owing to the use of grain-oriented silicon steels, the copper losses are 6 to 12 times greater than the iron losses, which makes perfect cooling of the windings all the more important (yet this is facilitated by the vertical position of the coils). On the other hand, the magnetic anisotropy of the transformer sheets may be turned to full account only in a shell-type transformer and would create serious design difficulties, say, in a three-phase yoke-type transformer.

The comparison of the two types should be based on no-load and copper losses, leakage reactance and short-circuit resistance, behaviour of the transformer under surge waves and thermal difference between windings and hot-point. The discussion also refers to the space factor in the "window" and points out that it would be wrong to base comparisons of the outputs of the two types only on the geometrical space factor of the "window." The advantages of the shell-type become conspicuous at higher powers, particularly when the behaviour under surge waves is considered.—"Design of Large H.V. Transformers," H. Chevalier, *Bulletin* Soc. Franc. Electriciens, 7th ser., Vol. 2, pp. 681–689, December, 1952, in French.

Finding Cable Faults

None of the known cable fault-locating methods that rely on calculations based on measurements, however accurate, permits of the position of a fault to be determined accurately to within, say, $\pm$1m. The errors are generally of the order of one per cent, but the author shows that a method suggested by Wurmbach in 1919 may be so improved as to make it possible for the fault to be accurately located. The method may be applied to cables of which at least one core is short-circuited to earth and of which the lead sheaths are arranged for uninterrupted metal contact through the junction boxes.

The first measurement between the defective cable core and the lead sheath (earth) is carried out by an ammeter in a circuit including a d.c. source (dry battery 6–100 V) and switch. The return current will then flow on the lead sheath (and, possibly, on the armouring) in both directions. The exact location is then made on the lead sheath by successive determinations of the current *direction* by means of a galvanometer of about 5 ohm instrument resistance, 2 ohm contact resistance and 5×10^{-6} V/sc.div. voltage sensitivity. These measurements are carried out through windows cut into the armouring to make the lead sheath accessible and will lead in a comparatively short time to the accurate determination of the fault position.—"Contribution to the Accurate Location of Faults on paper-insulated lead-covered Cables," H. Steinhaver, *Elektrizitatswirtschaft*, Vol. 51, No. 22, pp. 614–617, November, 1952, in German.

Static Charging Theory

The dangers of dust explosions in mines, grain mills and other industrial plants where large quantities of dusts of various kinds are bound to be produced are generally known, as also the fact that electrostatic phenomena cause them. Less catastrophic and yet undesirable phenomena due to the charging-up processes are observed in the paper, textile and many other industries, printing works, etc. Apart from the fact that mechanical energy conversion processes are always involved, the materials between which impact, friction, separation, or mixing processes occur may be of very different kinds and the two agents in such

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. —Editors, *Electrical Review*.

a process may be solids, liquids, or dispersions (sols). It would thus seem unlikely that a single explanation could be given for all these apparently different phenomena.

Yet it is possible to furnish such an explanation and, what is more, to demonstrate its correctness by many experiments. It is simply the fact that the adsorbed air film on the surface of any solid in the atmosphere contains prevalently ions of one polarity, whereas a second "sliding" air film superposed on the adsorbed one contains more ions of the other polarity. The top film is torn off by friction processes, thus "uncovering" the adsorbed film so representing a surface charge. Also, dust particles of different sizes may carry charges of different sign. It is therefore never the materials which really matter, but always the polarity of the ions in their adsorbed air film contrasting with that of the ions associated with the dust particles.—"Theory of the Charging Phenomena on Dust, Paper and Textiles," P. Boning, *E.T.Z.* (*A*), Vol. 73, No. 20, pp. 655–658, 11th October, 1952, in German.

Voltage Rise in Convertors

The rate of rise of the inverse voltage in rectifier circuits depends on the inductance of the commutation circuit and on the capacitances shunting the elements of the rectifier circuit. An increase of one or both these parameters reduces the rate of rise of the back voltage and thus the danger of back-firing. However, an increase of the capacitance, which increases the electric losses and in some types of installation may introduce the danger of arc extinction, is therefore not always feasible. Increasing the inductance is preferable, although an excessive increase may again render ignition of the arc difficult and also threaten to extinguish it.

The best solution is to use saturable reactors in the anode circuit which, if correctly designed, will represent a small reactance during the period of the rise of the d.c., but owing to the remagnetization of the core during the period of the back-current due to the inverse voltage the inductance will increase. The rate of rise of the inductance depends on the steepness of the magnetization curve and hysteresis loop of the core material at the reversal point. Eddy currents set up in the core material by flux variations will oppose remagnetization, reduce the slope of the curve and shift the inflection point. Unless considerable regulation angles are required and the rectifier load oscillates a good deal the recovery voltage curve may be given a nearly aperiodical character, even without damping resistances. A capacitance limiting the back-current to the value of the saturating current of the reactor core is required. Various rectifier circuits with saturable reactors are analysed and the parameters of the latter determined to suit various conditions.—"Control of the Rate of Rise of the Inverse Voltage in Circuits with Electronic Convertors," M. M. Akodis, *Elektrichestvo*, No. 10, pp. 31–37, October, 1952, in Russian.

Distribution System Calculations

A comparison of the results of calculations carried out by different methods shows that in a rationally designed urban distribution system the conductor sections should be determined on the following principles: whatever the type of low-voltage system used (return loop, interconnected feeders, ring system, or radial system) the conductor cross section should be determined from the permissible voltage drop at normal operating conditions, so long as the load density $D < 0{\cdot}200$ kW/m; at higher load densities the section should be determined from the permissible maximum current density under fault conditions.

To calculate the conductor section from the economic current density for a load distributed all over a main is not practicable, nor is it necessary to control the cross sections of the conductors of a system with protection by means of fuses for thermal load-carrying capacity under short-circuit conditions.

However, the cross sections of the cables of a medium-voltage loop-type distribution system should be dimensioned for thermal loading under short-circuit currents. These cables cannot be calculated for economic current density according to the regulations of the U.S.S.R. Ministry of Power Stations because the recommended figures would have to be multiplied by $\sqrt{3}$ in the case of lines with distributed load. Cable sections of a feeder system with current-limiting reactors should be calculated for permissible current density under fault conditions.—"Choice of the Method of Calculating Urban Distribution Systems," B. L. Aizenberg, *Elektrichestvo*, No. 12, pp. 9–13, December, 1952, in Russian.

ELECTRICAL EXPORT SERVICE

Comprehensive Aid for British Producers

UNDER the auspices of the British Electrical and Allied Manufacturers' Association and with the recognition of the Board of Trade an Electrical Industry Export Service has been established at 36, Kingsway, London, W.C.2. Mr. D. Maxwell Buist, export director of B.E.A.M.A., is the director of the new Service. Any bona fide electrical or allied manufacturer can become a member. The minimum annual subscription is fifteen guineas.

New Bulletin

One feature of the Service is an *Electrical Industry Export Bulletin*, a copy of the first issue of which is before us. It opens with a message from Sir Harry Railing, president of B.E.A.M.A., in which he stresses the important contribution which the electrical industry makes to this country's vital export trade. He mentions the B.E.A.M.A. Catalogue as an outstanding example of co-operation in the industry and recommends the new Service which, he says, is "designed to help all, large and small, experienced or not, who wish for information and guidance in work which clearly is in the national interest."

This theme is expanded by Mr. Buist in an article on "The Electrical Industry Export Drive." Mr. Buist refers to the difficulties now facing British exporters to show the need for the new Service which will add, if possible, to members' own information on markets abroad, trade regulations and conditions overseas, "to be at their service with a wealth of information and statistics which may be of supplementary help in their vital work."

In an article on the B.E.A.M.A. Export Department the course of events leading to the establishment of the new Service is traced. The export drive inspired by the Government in the earlier part of the war, before the institution of "Lend-Lease," led to the formation of the Electrical Export Groups embracing 425 electrical manufacturers of whom over 300 were B.E.A.M.A. members. In spite of the introduction of "Lend-Lease" these Groups were maintained. After the war it was realized that while electrical manufacturers could benefit from lessons learned during the war, a different form of organization was needed. Accordingly B.E.A.M.A. Council decided to replace the Export Groups by the new Export Service.

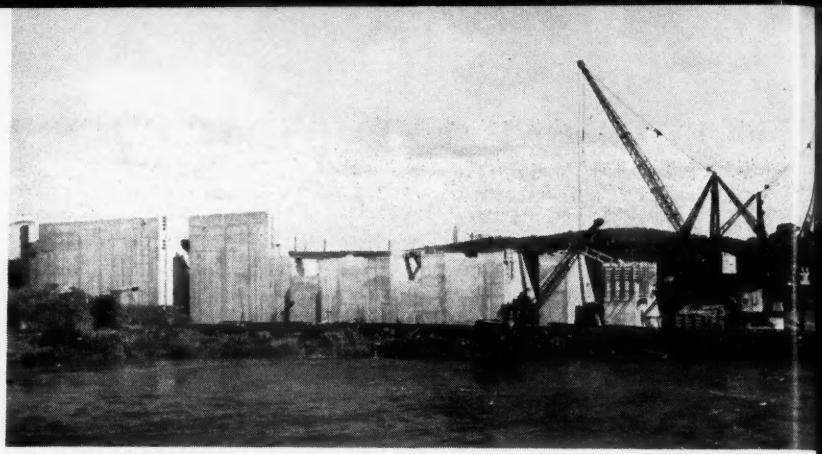
An Export Committee of the Council was set up and an Export Department established. Later it was found necessary to set up an Export Panel consisting of experts in export work who can be called together to give advice to the Export Department in important and urgent matters as they arise. It is the Export Department's purpose to canalize relevant data and current information, to form a research centre of the Export Service and, where necessary, to act on behalf of members individually and collectively.

The Department claims to have as complete a compilation of export trade statistics, home and overseas, as any other organization or Government Department and it has a valuable collection of particulars of export regulations, overseas import restrictions, quotas and tariffs, and electrical standards, voltages and frequencies in use overseas, all of which information is kept up to date.

Action on Behalf of Members

The Department can act directly on behalf of members and it is in a position to advise Government Departments in electrical trade matters and receive reciprocal help from those Departments in addition to representing the views of the electrical industry in matters likely to affect its export trade.

The rest of this first number of the *Bulletin* presents notes on important overseas developments of interest to British electrical manufacturers, reports of trade negotiations with particulars of results and notes on a wide variety of export matters. A statistical section gives in some detail the progress of United Kingdom electrical exports during the first ten months of 1952 and a territorial analysis of exports of selected domestic electrical appliances in 1951.



OWEN FALLS

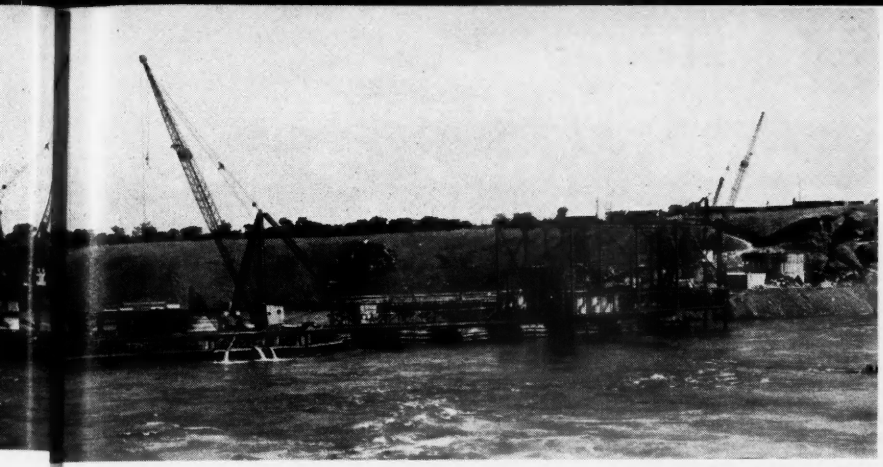
Generation Likely to Start This Year

PLANS for the economic development of the interior of Africa have one requirement in common: an abundant supply of electric power. This is to be provided by harnessing the great waterways of the continent, notably the Nile and Zambesi. The first of these projects, on the Nile at Owen Falls, Uganda, is now in an advanced stage. Construction commenced less than four years ago, yet despite the hazards inseparable from such a large engineering undertaking, it is expected that generation of hydro-electric power will begin before the end of this year as scheduled. The scheme is being undertaken by the Uganda Electricity Board, established in 1948 under the chairmanship of Mr. C. R. Westlake, M.I.E.E., the consulting engineers being Messrs. Kennedy & Donkin and Sir Alexander Gibb & Partners.

In the earlier stages of the work abnormally high rainfall caused some delay, while last year dewatering of the main cofferdam was held up when hitherto undiscovered faults in the bed of the river were encountered. At the end of December concreting work was in progress for the first five generating sets and excavation for the remaining sets was nearing completion. Accommodation is to be provided for ten 15,000 kW sets and present plans are for the actual installation of six of these, the turbines being manufactured by Boving & Co., Ltd., and the alternators by the British Thomson-Houston Co., Ltd. Precasting and erection of concrete structures for the switching station sufficient for the first four sets was completed and a start had been made with the concrete of the main cable ducts and the plant house. The spiral casing for No. 1 turbine had been installed and the stay rings for sets Nos. 1 and 2 assembled. In the substation the majority of the 33 kV insulators had been assembled on their supports. No major difficulties were experienced in connection with the delivery of plant.

An event of considerable importance during the year was the decision, subject to a formal agreement being completed, to erect a transmission line from Owen Falls to the Kilembe copper site. Together with a proposed railway extension, this will have far-reaching effects on the economy of the protectorate by making possible the development of Western Uganda.

It is believed that the whole of the power available at Owen Falls will be demanded by 1956–57, but unfortunately there is little chance of large industrial developmen



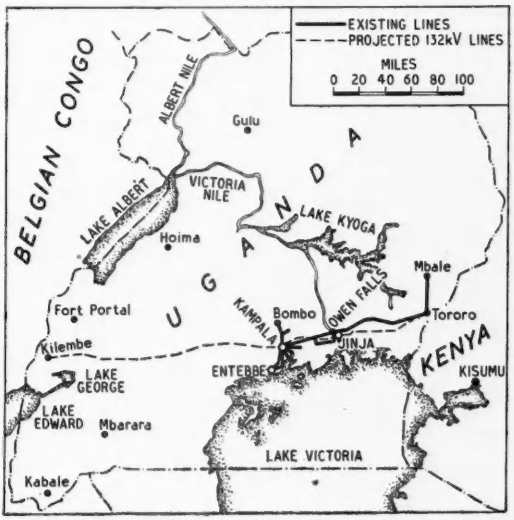
View of the scheme looking downstream (photograph taken in January, 1953)

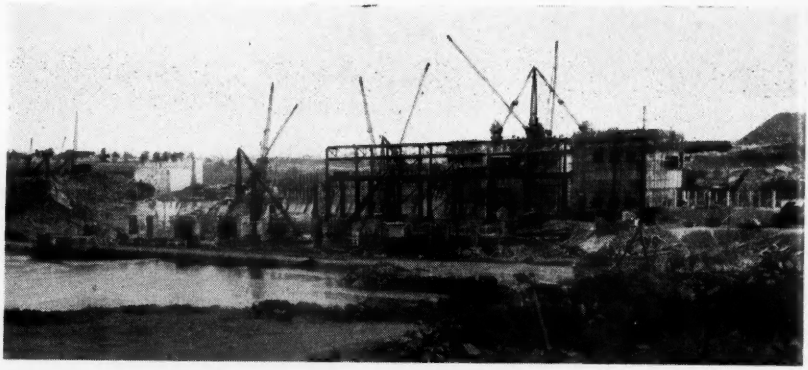
before then. This loss of potential revenue is especially serious as the total direct cost of the Owen Falls scheme is now estimated at £10,843,344, approximately twice as much as was given in the project report. The Board has in hand the formulation of tariffs to be applied when the hydro-electric scheme comes into operation and on this subject its 1952 report says that should sub-economic tariffs be desirable, from the wider viewpoint of industrial development, the Board must look to the Government for recoupment.

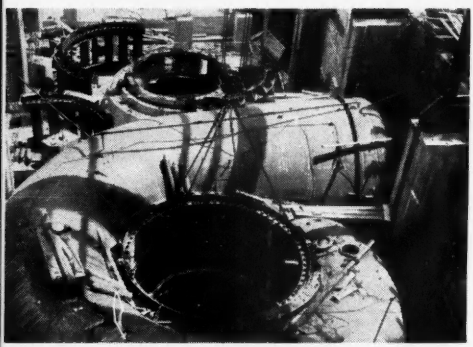
The Board's capital expenditure during 1952 amounted to £4,380,365, making the total £10,496,231. Application was made for an increase from £13 million to £20 million in the amount to be borrowed under the agreement made in 1950 between the Board and the Uganda Government.

Up to the end of last year a total of 382 miles of high voltage and 100 miles of low voltage lines had been erected and 12·9 miles of h.v. and l.v. cable laid. Schemes completed during the year included a 33 kV transmission line from Kampala to Entebbe and a 11 kV extension from the Kampala–Namulonge line to Bombo, while further extensions and improvements were carried out on the distribution system at Kampala, Jinja and Entebbe. Approval was given during the year for capital development schemes costing some £200,000, as well as the erection of the 132 kV transmission line to Kilembe already referred to. Sales of electricity (generated at the Board's thermal stations) totalled 33·8 million kWh and revenue amounted to £368,514.

Three further Harland & Wolff 940 kW diesel generating sets were commissioned during the year at Njeru temporary thermal station, near Jinja, to complete the eleven sets with an installed capacity of 10,340 kW. The number of consumers at the end of December was 8,783 compared with 3,263 when the Board was established in 1948.

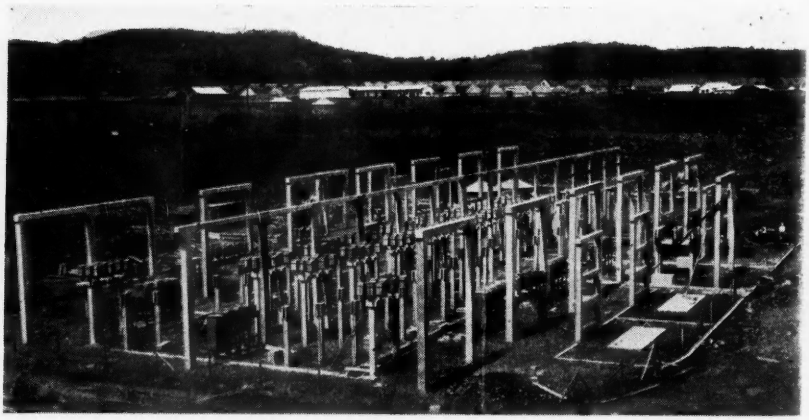






Above: **Power house and intake dam.** *Left:* **Spiral casing for No. 1 set.** *Below:* **Switching station**

Arrangements were made for an architectural competition in connection with the design of a head office building for the Board at Kampala. During the year Mr. F. J. Lattin, C.M.G., formerly Development Commissioner in Uganda, succeeded Sir John Kennedy as the Board's London representative. Owing to the inadequacy of the previous accommodation a move was made to offices at 27, Regent Street, S.W.1, which are being shared with the London organization of the newly-formed Uganda Development Corporation.



VIEWS on the NEWS

By REFLECTOR

IN West Berlin the electricity supply company has had to increase its charges because of the higher cost of coal and transport and naturally the Berliners do not like it. Accordingly a number of shopkeepers and restaurateurs in many parts of the city decided to protest by switching off all their internal and external lighting and making do with candles and oil lamps. I do not know what effect this " gesture " is likely to have, but candles are an expensive substitute for electricity, even at the Berlin rates, and oil lamps (unlike electricity) are odorous.

* * *

Separatist movements are developing in Scotland and Wales in which electricity supply is involved. There has been a call by the Convention of Royal Burghs for " the fullest practicable administrative autonomy for all nationalized industries in Scotland." The Association of Welsh Local Authorities has asked its members to consider a resolution from the Caernarvonshire County Council demanding the establishment of a separate electricity authority for Wales and Monmouthshire. Thus there is a prospect of special Cymric, as well as Caledonian, kilowatts.

The Welsh move has the support of Mr. R. Palme Dutt, of the Communist Party, who is reported to have said at a recent meeting that there were " limitless possibilities " of hydro-electric development in North Wales. " At present it was being used to provide cheap power for the big industrialists in Lancashire and the Midlands." With a little aid from thermal stations, I believe.

* * *

Fort Augustus, in Scotland, cannot find anybody to take on the job of lighting manager because the street lamp switches are too high up the lamp posts. So the local Council has asked the North of Scotland Hydro-Electric Board to fix the switches lower down. But this, of course, as has been recognized, will attract the attention of " practical jokers." It looks to me as though Fort Augustus should look for a giant or provide stilts for its prospective lighting manager.

* * *

A recent report in the *Lincolnshire Standard* of the installation of a 132 kV substation at Boston bore the heading " To Make Your Lights Burn Brighter."

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Merseyside and North Wales Electricity Board has appointed **Mr. M. M. Parker** secretary to the Board in succession to **Mr. James Rankin,** O.B.E., who was appointed deputy chairman of the Board on 1st January last.

Mr. M. M. Parker

Mr. Parker is a solicitor and has been deputy secretary to the Board since April, 1948. He was articled to the Town Clerk of Shrewsbury in 1933 and after passing the solicitors' final examination was employed in the Town Clerk's office. In 1939 he was appointed assistant solicitor to the county borough of Wolverhampton. On the outbreak of war he enlisted in the army and was commissioned in July, 1940, serving until released in 1945 with the rank of major to resume his appointment in Wolverhampton. In the following year he became senior assistant solicitor to the county borough of Preston where he remained until he obtained his appointment with the Merseyside and North Wales Electricity Board.

Crompton Parkinson, Ltd., have announced the following managerial changes :—**Mr. J. V. Daniel** has been appointed a joint managing director. He has been associated with Crompton Parkinson since 1927, and has served as plant sales manager at Nottingham and Manchester, general sales manager of the plant division, assistant general manager of the British Electric Transformer Co., Ltd., and in 1948 was appointed deputy works director for the southern works of the company. Mr. Daniel has been an executive director of Crompton Parkinson since 1946, and in December, 1949, was appointed assistant managing director (works), in that capacity assisting the joint managing directors of the company on works matters. He was elected to the board in January, 1952.

Mr. J. V. Daniel

Mr. J. B. Scott

Mr. D. E. Graham

Mr. J. B. Scott, D.F.C. & Bar, Associate I.E.E., an executive director and at present assistant sales director (home), has been appointed a sales director. From 1st April next he will assume full executive responsibility for both home and overseas sales. **Mr. C. F. Dickson,** O.B.E., will continue to serve the company in its sales and other activities, remaining a sales director until 30th June next, and thereafter as a member of the board. Mr. Scott went to the company in 1939 and was with the plant division in London and Manchester until he joined the R.A.F. On demobilization in 1946 he returned to the company as branch manager, Manchester. He became London branch manager in 1947 and general sales manager of the plant division in 1948. He held this position until 1951 when he was appointed executive director and assistant sales director (home).

Mr. D. E. Graham, Associate I.E.E., M.I.Ex., the general sales manager of the overseas division, has been appointed an executive director. He represented F. & A. Parkinson in New Zealand from 1925-28, was manager for Crompton Parkinson, Ltd., in Malaya from 1928-33, and was then with the Manchester and Birmingham branches until 1935. After another year in India, Burma and Ceylon, he rejoined the Birmingham branch, becoming manager in 1938 until 1940 when he was appointed manager of the Heavy Plant Department, Chelmsford. In 1945 he was appointed to his present position.

Mr. Edward Jones, M.I.E.E., M.I.Mech.E., who is retiring from the position of deputy chairman of the South

Wales Electricity Board, has been presented with a record player. The presentation was made recently by Mr. G. Bates, a former member of the Cardiff Corporation Electricity Department, in the absence through indisposition of Mr. A. J. Channing, Central Sub-Area manager of the Board. Before nationalization Mr. Jones was city electrical engineer at Cardiff.

Mr. W. W. Weston has now taken up his appointment as sales manager of Brynmawr Rubber, Ltd., at the new London offices at 23, Lincoln's Inn Fields, W.C.2. **Mr. J. Birkbeck,** A.I.R.I., has been promoted works manager.

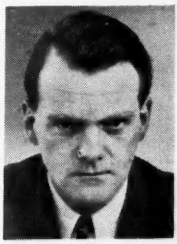
Mr. W. B. Robson has been elected to the board of Cantie Switches, Ltd., Bromborough. He joined the company, as general manager, in September, 1951, and was previously with Brookhirst Switchgear, Ltd.

The Metropolitan-Vickers Electrical Co., Ltd., announces that **Mr. H. S. Carter,** B.Eng., has been appointed sales manager of the Heating and Welding Department, which has been formed to co-ordinate the sales of heating elements—including radiant boiling plates and infra-red equipment—radio frequency heaters, induction furnaces, welding equipment and electrodes. Mr. Carter took a first-class honours degree at Liverpool University, and joined the Metropolitan-Vickers Co. as a college apprentice in 1935. Subsequently he joined the staff of the Research Department, where during the war he handled contracts in connection with the original chain of radar defence stations. In 1946 he transferred to New Products Sales, and in 1949 to Heating Elements Sales.

Mr. H. S. Carter

The South Wales Electricity Board announces the following appointments:—**Mr. V. R. Rose,** A.M.I.E.E., has been appointed senior assistant engineer, Central Sub-Area (Cardiff), in succession to the late Mr. T. R. Kernick, A.M.I.E.E. Mr. Rose was formerly second assistant engineer in the Central Sub-Area. **Mr. H. Jackson,** B.Sc., M.I.E.E., M.I.Mech.E., formerly district commercial manager, District 348 (Cardiff West), has been appointed a senior assistant (industrial supply) in the Commercial Department of the Board's Central Sub-Area (Cardiff) in succession to **Mr. W. P. Warren,** B.Sc., A.M.I.E.E., who has been appointed as a senior assistant (industrial development) in the Commercial Department at the head office of the Board at St. Mellons. **Mr. A. Evans,** A.M.I.E.E., formerly senior assistant in the Purchasing Department of the Board at St. Mellons, has been appointed commercial manager, District 223 (Swansea), in succession to **Mr. G. J. Higgs,** A.M.I.E.E., who has been appointed as a senior assistant in the Commercial Department of the Board's West Central Sub-Area at Swansea.

Mr. L. W. D. Sharp, M.A.(Cantab.), A.M.I.E.E., has been appointed chief engineer of the Components Division of the Plessey Co., Ltd. Mr. Sharp, who joined the company in 1948, has, for the last two years, been chief radio engineer, Telecommunications Division, engaged in the development of radio equipment for mobile applications and for ground-to-air and fixed link communication. Before joining the company he was for some years with E. K. Cole, Ltd., during the last three of which he was responsible for car radio development.



Mr. L. W. D. Sharp

Mr. C. L. Hill, deputy chairman of Heenan & Froude, Ltd., has been appointed chairman in succession to the late Mr. A. P. Good.

Mr. H. F. Judd has been appointed general sales manager and a special director of Ioco, Ltd.

Mr. M. Britton Johnson has relinquished the appointment of district manager (S.W. England) for W. T. Glover & Co., Ltd., to take up the head office appointment of assistant sales manager of the company. Following earlier experience in the cable industry, Mr. Johnson joined Glovers sales staff at Birmingham in 1936, continuing there, apart from war service, until 1946 when he was appointed district manager (South West England). During the war, with the rank of lt.-colonel, he commanded the 2nd Royal Marines Armoured Support Regiment, and since the war has continued his interest by commanding the Royal Marine Forces Volunteer Reserve in Bristol.

Mr. M. Britton Johnson

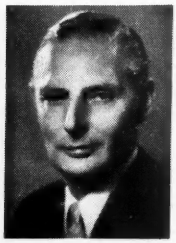
Councillor F. W. Thompson has accepted nomination as Oldbury's Coronation Year Mayor. Councillor Thompson, who is on the

staff of the production control of the Simplex Electric Co., Ltd., Oldbury, has been a member of the Council for fourteen years.

Mr. E. C. Scott, B.Sc.(Eng.), A.M.I.E.E., who for the past two years has been personal technical assistant to Sir John Hacking, deputy chairman (operation), British Electricity Authority, has been appointed system operation engineer in the Authority's North Eastern Division, in succession to **Mr. A. W. Mitchell,** who is retiring at the end of March.

Mr. Scott, who was educated at Dundee High School and St. Andrews University, is fifty-one years of age. After completing a college apprenticeship course with the Metropolitan-Vickers Electrical Co., Ltd., he spent three years on relay design in that company's Meter Department. For four years he was system control engineer with the Perak River Hydro-Electric Power Co., Malaya. On returning to England in 1933, he joined the operation branch of the South West England and South Wales district office of the Central Electricity Board, and subsequently went to headquarters in London as an area assistant in the system operation branch. After vesting day, Mr. Scott became a senior assistant engineer in the branch and for two years before his appointment with Sir John Hacking was chief assistant to the system operation engineer.

Sir Philip Warter, who, as reported on another page, has intimated his acceptance of the chairmanship of Enfield Cables, Ltd., is chairman of the Associated British Picture Corporation, Ltd., and managing director of the British & Foreign Wharf Co., Ltd. During the war he was successively director of warehousing, Ministry of Food, and controller-general, factory and storage premises, Board of Trade. For a year after the war he acted as adviser to the Board of Trade on industrial estates. He was knighted in 1944.



Sir Philip Warter

Sir Edwin Herbert, LL.B., who has also accepted an invitation to join the Enfield Cables board, is a solicitor with much public service to his credit. He is also a director of Broadcast Relay Service, Ltd., chairman of Broadcast Relay Service (Overseas), Ltd., and director of Industrial & General Trust, Ltd.

The annual dinner and dance of the Newcastle Centre of the **Illuminating Engineering Society** was held at the County Hotel, Newcastle, on 6th March. Mr. G. Kingsley Lark (Inductive Appliances, Ltd.), chairman of the Centre, proposed the health of the guests and Mr. C. A. Harding, F.R.I.B.A., president of the Northern Architectural Association, responded. The toast of the Society was proposed by Councillor A. Howell, chairman of the Newcastle Lighting Sub-Committee, and Dr. W. J. Wellwood Ferguson, president of the Society, replied. Mr. E. C. Lennox acted as toastmaster.

Mr. G. Kingsley Lark speaking at the dinner of the Newcastle Centre of the I.E.S. On the left is Mrs. Wellwood Ferguson, wife of the I.E.S President

The annual staff party of **Wheeler Electrical Supplies (Wholesale), Ltd.,** was held in Derby last week. About forty-five attended and the chair was taken by the managing director, Mr. C. S. Wheeler.

Mr. Gunnar Poppe, O.B.E., M.A., has been appointed general manager and director of James Beresford & Son, Ltd. (subsidiary of Cornercroft, Ltd., Coventry). Mr. Gunnar Poppe was with the Austin Motor Co., Ltd., from 1923 to 1932, after which he occupied various executive positions with the Rootes group of companies.

Mr. Gunnar Poppe

The London Group of the **Royal Engineers' Association** is to hold a "London Sapper Reunion" at the Drill Hall of the 101 Field Engineer Regt. R.E. (T.A.), Duke of York's H.Q., Chelsea, on 16th May. Tickets (3s each) are obtainable from the London branches hon. secretaries or by post from M. J. S. Pearson, Room 31, The Horse Guards, S.W.1, and Mr. C. G. Mathews, 29, Thurlow Street, S.W.7.

Admiral Sir Michael M. Denny, Third Sea Lord and Controller of the Navy, speaking at Bath on 2nd March, said that because the Navy was becoming so increasingly electrified every encouragement would be needed from the electrical engineering profession as a whole in this country in the future. He was proposing the toast of the **Electrical Engineering Departments in Admiralty Service** at a dinner to celebrate the fiftieth anniversary of the first appointment of electrical engineering officers by the Admiralty. Referring to the present transition in the department from civilian to naval control, Admiral Denny said that after the last war it became essential that every branch of the Royal Navy should have an electrical officer in every ship. Referring to the coming establishment of the new Naval Electrical Department in the Navy, he said it was hoped that within twenty years the naval electrical group of officers would be 1,200 strong and would contain 100 officers serving in appointments now held by officers of the Electrical Engineering Departments of the Admiralty.

In responding, Sir Hamish MacLaren, Director of Electrical Engineering, said that the naval electrical officers, by careful planning, education and training, should be capable of taking responsibility in due course, but during the transition stage a very heavy responsibility fell on the Department to ensure that the change-over was effected smoothly and efficiently. He mentioned that a telegram of loyal greeting had been sent to Her Majesty the Queen, who had replied expressing her thanks.

Other speakers were Mr. W. McClelland, former Director of Electrical Engineering (1919-1934), Mr. W. C. M. Couch, Deputy Director of Electrical Engineering, and Captain Peter Horn, U.S. Naval Attaché in London.

OBITUARY

Mr. H. C. S. Runnals.—The General Electric Co., Ltd., announces the death, which occurred on 13th February, of Mr. H. C. S. Runnals, former manager of the company's Swansea Branch, who retired at the end of January, 1950.

Radio Materials

AN important factor in the progress of radio communications has been the development of new materials and their use in new devices of improved performance. The principal classes of radio materials are conductors, semi-conductors, dielectrics and magnetic materials. Knowledge of the properties and behaviour of conductors is well advanced, but the properties of the other three classes of materials are not so well understood and much work remains to be done before their behaviour in all conditions can be completely predicted.

Radio Research Special Report No. 25, "Selected Problems in the Preparation, Properties and Application of Materials for Radio Purposes," has been produced by the Radio Materials Committee of the Radio Research Board and is available from H.M. Stationery Office, price 1s 6d. It is based on the work of several groups of experts who have studied the present state of knowledge of ceramics, organic polymeric dielectrics, magnetic materials and semi-conductors. The report is divided into sections dealing with these materials, each section outlining existing knowledge and stating the research problems which most urgently need attention if the material is to be fully exploited for radio purposes.

Practical Stud Welding

AT a meeting of the Institute of Welding at the Royal Victoria Hotel, Nottingham, on 23rd February, Mr. R. W. Taylor (Crompton Parkinson, Ltd.) presented a paper dealing with the practical aspects of stud welding. He dealt with the subject generally but made particular reference to both "Nelson" and "Cyc-Arc" stud welding equipment and methods.

After defining the term "stud welding" and briefly outlining the history of the process Mr. Taylor gave a detailed description of the equipment employed, followed by a discussion of power sources and cables. He then devoted attention to practical considerations of interest to welding engineers and concluded by dealing with the comparative costs and advantages of the process. He also gave a large number of examples of possible applications of stud welding.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £338 10s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £92 15s 0d
Foreign	ton £91 10s 0d
MERCURY	flask £70 10s 0d
TIN	ton £959 0s 0d
ZINC, G.O.B. Foreign	ton £79 5s 0d
Electrolytic	ton £83 0s 0d
BRASS Tubes	lb 2s 1¾d
Sheet	ton £266 15s 0d
Wire	lb 2s 7¾d
PHOSPHOR BRONZE	
Wire	lb 4s 1¾d
RUBBER, No. 1 R.S.S. spot ..	lb 22¼d-22½d

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Interfering "Zebras"

VERY shortly, there will be installed all over the country, thousands of flashing illuminated beacons on zebra crossings, and in addition, the Minister of Transport is reported to be about to permit flashing direction indicators on cars.

It is understood that these devices will be fitted with suppressors to prevent interference with radio and television reception; but when it is realized that the beacon flashers will have to operate continuously day and night at the phenomenal rate of 57,600 times per day, one can only hope that the suppressors will be effective when the flasher contacts have become pitted, as they inevitably must under such arduous conditions of service.

It would appear essential for arrangements to be made to service these devices frequently, not only to ensure that they are flashing properly, but to check that they are not causing interference due to deterioration of contacts.

The problem will be intensified if the Minister of Transport permits flashing car indicators. These will also require efficient interference suppressors, but it is difficult to see how the requirement can be enforced. It is to be hoped, therefore, that the Minister will not give his blessing to so doubtful an innovation.

JOHN BAGGS.

Oldham, Lancs.

"Quicker Construction"

I WAS interested in your reference (*Electrical Review*, 6th March, page 510) to the recent publication of a report to the Minister of Housing and Local Government and Secretary of State for Scotland entitled "Quicker Completion of House Interiors."

I think it may well be that this publication will go some way in decreasing the time required for house construction, but think it was a mistake that the Committee did not consult those members of our industry who could at least have helped them to reach better conclusions than they have in some instances. Why is it, for example, that the architects propound the view that 15 A outlets should be used throughout the installation; and why is it that they consider the number of light and power points per house should be kept to the minimum, when it will cost far more to add a socket outlet after the house is occupied?

The chartered surveyors also have their say and rightly suggest ceiling lights in preference to pendant drops, but with the ceiling heights envisaged in the report it would be impracticable to install pendant drops and, further, if semi-detached and terraced type houses are to be built, cord-operated ceiling switches are far too noisy unless sound-proof insulation materials have been adopted.

The report deals with costs, as referred to by you, but I think very few installation engineers would agree with the emphasis which is put on pre-assembled wiring harness.

It is easy to be critical of any report, but the point I wish to stress is that apparently there is insufficient liaison between the electrical industry and those responsible for building, be they architects, surveyors, or construction engineers, and until this deficiency is put right there will be little improvement in the electrical facilities available to the occupier and, on the constructional side of building, there will be little development in electrically operated mechanical means of improving and accelerating building construction.

Brighton. M. W. HIME, A.M.I.E.E., F.I.E.S.

Back-Pressure Generation

APART from the admission that back-pressure power generation may sometimes be advantageous, the leading article in your issue of 13th February is wrong in nearly everything it says, or implies.

The condition that the demand for steam and electricity must be matched hour by hour is probably never met in the hundreds of back-pressure plants up and down the country. Conditions at Wilton are not so favourable as those in many other works, and the balance that is achieved at Wilton is done by working in with the North Eastern Electricity Board. Any back-pressure plant regardless of size is in perfect automatic balance if it runs in parallel with the public supply. Where the attitude of the Area Board prevents such automatic balance there are all kinds of ways in which practical balance can be reached—steam storage, hot water storage, etc.

To suggest, as does your article, that no prima facie case exists for back-pressure plants of less than 5 MW can only mean that those concerns that have specialized for years in the design and manufacture of back-pressure plants of less than 5 MW, firms like Belliss & Morcom, Allens of Bedford and many others, have built up their great reputations on a fallacy and have been deluding their thousands of customers, all of whom have been wasting their money. Come, come, Mr. Editor!

Very small plants have just as great a claim to back-pressure working as larger plants. Here are two elementary examples: A small direct-acting boiler feed pump exhausting to atmosphere probably has an overall thermal efficiency of 2 per cent. Turning it into a back-pressure plant by piping its exhaust into the boiler feed tank raises its efficiency to 50 per cent, or more. There are many hot water heating plants where steam is put into a calorifier and the circulating pump is driven by an electric motor. An elegant and efficient alternative is to run the pump from a tiny single wheel turbine which exhausts into the calorifier.

If Wilton with a turbine of 17·5 MW and the calorifier pump with a turbine of perhaps 0·00175 MW are both efficient back-pressure plants, surely everything in between has a prima facie case for consideration.

London, E.C.3. OLIVER LYLE.

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons last week Mr. John Grimston raised the question of the charges of the Eastern Electricity Board. One factory in which he was interested, the Enfield Rolling Mills, had been asked to pay 40 per cent more for its electricity—£40,000 a year. Also, it was being asked to take its electricity at the peak period, when the generating stations found it difficult to meet the load. Thirdly, the company would have to sell, because they had been rendered redundant, approximately £100,000 worth of electricity generators. They had been put in since the war and cost dollars. A special allotment from the Treasury was made for their purchase in order to help the problem of load shedding. They had now become redundant and would have to be scrapped.

Finally, the company was being asked to buy at "fancy prices" equipment which had hitherto been supplied free by the supply authority. He thought the main reason why prices were going up was because the B.E.A. desired uniformity all over the country in scales of charges. It was quite clear that the Central Authority was urging Area Boards not to give way to special consumers or to consumers who in any way sought to take advantage of the periods during the day when the electricity generating authorities would be only too happy to sell additional quantities of electricity.

To justify its stand, the Eastern Electricity Board said there were now no peaks, no periods during the day when electricity generating stations were strained to the utmost. That was not in accordance with paragraph 243 of the Ridley Report. From the annual report of the B.E.A. it would be seen that there were still large peaks occurring at the normal morning and evening hours in the winter, which the generating authorities were unable to meet. It was clear, therefore, the Authorities could and should continue to offer favourable terms to consumers who did not require electricity during the peak period.

Mr. Spencer Summers spoke of a number of small businesses which had been hit by the increased tariff. If the Eastern Electricity Board really wanted consumers to switch off there would be a much more far-reaching effect if the alternative tariff operated from 7 p.m.

Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, said that

Section I (6. c) of the Electricity Act specifically laid on the Electricity Boards the statutory obligation of not granting any undue preference in the provision of supplies.

Mr. Grimston said it might grant a preference where the characteristics of the load were different.

Mr. Joynson-Hicks said he quite agreed that in a case such as that the Board was entitled to enter into a special agreement within the general limits of the tariff, but that, he understood, it was already doing and in this case it had a special agreement which was on better terms than the ordinary tariff. If that was not the case then the company concerned was perfectly entitled to say that it would prefer to take the ordinary tariff which was open to everybody. There was bound to be a certain amount of difficulty about the ordinary industrial tariffs. When the Boards undertook the obligation laid on them by Parliament to standardize their tariffs, in some cases they had to try to reduce the number of tariffs in their area from 600 to between ten and twenty. The Minister had arranged with the Boards that when these tariffs had had a fair opportunity of being observed in practice and when their full effect had been seen during summer and winter—that probably meant at the end of the year after being brought into operation—they should be reviewed by the Boards with the Consultative Councils, because the Councils had to approve the tariffs. The representations made would be considered by the Consultative Councils at that time in conjunction with the Boards. If the Councils were unable to get the case which they ultimately believed to be the right one accepted by the Boards, and if they felt justified in so doing, they could make representations to the B.E.A. and later to the Minister.

This case emphasized the tremendous change in the relationship between producer and consumer of electricity over the past quarter of a century. One could well imagine that in the old days it would have been of the greatest value to a private undertaker, producing and supplying electricity himself, to have a big, steady consumer taking a basic load, which would meet his overhead expenses, and it would be economic and efficient for him to give such a consumer a very favourable tariff indeed. But tremendous changes had taken place. Station after station had been linked together so that although Mr. Grimston's electricity might come from Brimsdown power station it might also come from Birmingham, Bristol or almost anywhere else. That was one of the great difficulties to be faced in realizing the change in the relationship between the supplier and the producer of electricity at present. The Government was prepared to stand by the principles of the Ridley Report, and he hoped they would have time to debate them when a whole day was given to this subject on 13th March.

Breadalbane Scheme

Mr. Nabarro asked the Secretary of State for Scotland on what date the estimated cost of £15,103,000 for the Breadalbane project, Construction Scheme No. 25 of the North of Scotland Hydro-Electric Board, was computed; what steps had been taken to adjust the estimated cost to the level of prices obtaining for materials and labour at 30th January, 1953; and, in view of the five to seven year constructional period, what estimate had been formed of the increase in aggregate cost that would take place before completion date, including such considerations as the recent increase of approximately 5s 6d per ton in coal, with consequential increases in steel, cement and freight costs.

Mr. Stuart said he was informed that the estimate was made shortly before the publication of the Scheme in March, 1951, and contained a 10 per cent margin for contingencies. The present estimate was about 20 per cent higher. Changes in prices over the next five to seven years could not be foreseen, but steps were continually being taken to offset increasing prices by improvements and economies in the methods of construction.

Power in Malaya

Mr. Gilbert Longden asked the Secretary of State for the Colonies whether he was aware of the need for rapid development of supplies of electric power in the Federation of Malaya; and what steps were being taken to meet this need.

Mr. Lyttelton said he was. In 1949 the Federation Government set up the Central Electricity Board which, in addition to extending supplies to small towns, had completed and brought into operation the first half of a power station of 80 MW near Kuala Lumpur. Plans for the future included more extensions to the grid and possibly more hydro-electric power stations.

Television for Cornwall

Replying to Sir Harold Roper, the Assistant Postmaster General (Mr. Gammans) said that the B.B.C.'s general plan approved in principle by the Government provided for a station near Plymouth. The Corporation had in mind a site at North Hessary Tor, but was now testing a possible alternative in order to estimate its approximate coverage.

G.E.C. Olympia Display

In our notes on the Ideal Home Exhibition last week we referred to the DC 735 four-plate cooker on the stand of the General Electric Co., Ltd. Actually the cooker is the company's DC 753 three-plate model.

Electricity Supply Costs

Wages and Coal Prices

By an Industrial Correspondent

AFTER second thoughts, the British Electricity Authority issued a more cautious statement on the probable effects on electricity charges of the 10 per cent rise in the pithead price of coal. But it was noticeable that, in their statements, both the spokesman of the London Electricity Board and the chairman of the North Western Electricity Board linked wages with increasing costs. The L.E.B., in fact, gave a " clear warning that, if the cost of coal and wages continue to rise every few months, then the price of electricity, like the price of most other commodities, must be subject to successive increases."

Effect on Industry

The B.E.A. for some time now has been concerned with increasing costs. During the negotiations with the unions last year on the applications for further wage increases, its representatives drew attention to " three factors which might be singled out as affecting the cost of industry in general—coal costs, transport costs and wages." And the annual report of the Authority, issued at the time of these negotiations, dealt in some detail with rising costs in the industry. Increased fuel prices, transport rates and wages and salaries together accounted approximately for 60 per cent of the industry's current expenditure, and capital charges accounted for a further 24 per cent.

Earlier, Lord Citrine had mentioned the gravity of increased coal and freight charges. The combined effect of these charges had been to raise the price of coal to the Authority by 4s a ton, and during the financial year 1951–2 the increased charges the Authority had had to meet were approximately £20 million over and above the comparable charges for the year 1950–51.

It is hard to see how the decision of the North Western Electricity Board announced by its chairman, Sir Joseph Hallsworth, not to make any additional increase in its tariffs might help " to break the spiral of increased costs and wages." The increase in coal prices has already been fixed and there is no guarantee that there will not be further increases. Mr. E. H. Browne, production director of the National Coal Board, has expressed the view that, unless sufficient manpower became available and reconstruction went ahead faster, every increase in production was likely to be accompanied by a sharp rise in the cost of producing " marginal " tonnage.

In 1951, at inland prices, 21 million tons of coal out of a total of 210 million from N.C.B. mines was produced at an operating loss exceeding 10s a ton. Ten million tons was produced at an operating loss of £11¾ million, an average of 23s a ton. Within that, moreover, 2½ million tons caused a loss of £4 million, or 32s a ton, and a final 1 million tons at a loss of over £2 million, which averaged 42s a ton. " It was likely," concluded Mr. Browne, " that the rate of increase in the marginal zone will rise very rapidly indeed in the long run, and every extra ton produced will add an increasing burden to consumers as a whole."

Nor can there be any easy optimism on freight charges. Here again, the industry is likely to be faced with rising costs.

Trade Union Attitude

It is in this context that the recent statement of Mr. Frank Foulkes, general president of the Electrical Trades Union, should be read. Speaking at Wolverhampton on 21st February, he said that " future wage agreements would have to be matters of more than pure negotiation and that the Union might have to revise its old motto ' Defence not Defiance.' " The period during which the Union had relied on pure negotiation, on Whitley Councils

and on arbitration for its wages agreements had now passed, he declared. "In future members will have to take a really active interest in wage applications, attend their branch meetings and convince employers that my negotiating ability has their solidarity behind it or we shall not get any more wage increases."

But whether this would help to solve the spiral of increasing costs, to which Sir Joseph Hallsworth referred, Mr. Foulkes did not attempt to explain.

Hydro-Electric Plant

Recent Boving Turbine Contracts

GREAT progress was made during 1952 on the many hydro-electric installations for which Boving & Co., Ltd., are supplying the turbines. In Spain the erection of the first of the two 59,000 h.p. Francis turbines of the Salto de Castro plant of Iberduero S.A. Bilbao was completed and the unit went on commercial load early in August. The second set will be commissioned early this year. These two turbines have what are believed to be among the largest runners of fabricated construction yet built in Europe; each is 4·4 metres in diameter and weighs about 47 tons.

Erection started on the three turbines for the Los Peares station for F.E.N. O.S.A. of La Coruna. This order covers three vertical Francis turbines each of 73,000 h.p. output at 214 r.p.m. under a head of 98 metres. At the Colmenar station of Lute, near Valencia, the erection of the two 4,000 h.p. 600 r.p.m. vertical Francis units was completed.

In Scotland much work is in hand for the North of Scotland Hydro-Electric Board. During the year erection of the three 35,000 h.p. Francis turbines at Errochty commenced. The power station building is now nearing completion and erection will proceed quickly in 1953. Errochty is the third station in the Tummel-Garry group, the two earlier stations, Clunie and Pitlochry, having been commissioned in 1950 and 1951, Boving & Co., Ltd., supplied all the turbines for these stations. Erection also commenced during the past year at Torr Achilty in the Luichart-Glascarnoch-Torr Achilty scheme, where two vertical Kaplan turbines each of 10,900 h.p. are being installed. These machines are duplicates of those in service at Pitlochry and which under full commercial operation are producing about 57 million kWh annually.

For the Owen Falls scheme in Uganda the first turbine and parts of the second and third were shipped and site erection of the first is well advanced. Six Kaplan turbines, each of 21,000 h.p., are on order and the station is designed to accommodate ten units ultimately.

Instructions were received during the year from the Tasmanian Hydro-Electric Commission to proceed with manufacture of the fifth unit for Tungatinah. All five turbines, which are of the high-head vertical Francis type, are being supplied by Boving & Co., Ltd., and each unit develops 35,000 h.p. at 600 r.p.m. under a head of 285 metres.

In India the last machine at Muhammadpur was put into service. This station on the Ganges Canal contains three Kaplan turbines each developing 4,250 h.p. at 5·3 metres head. The three 18,000 h.p. 428 r.p.m. vertical Pelton turbines for the Government of Madras at Moyar were all commissioned during the year. The two 15,400 h.p. Kaplan turbines at Rasul in Pakistan were also started up.

For the New Zealand State Hydro-Electric Department two additional 23,000 h.p. vertical Francis turbines are on order for Waitaki. One of these was shipped in 1952 and the other will be dispatched early this year. Including the above there will be seven units in this station, all the turbines for which, with the exception of the third and fourth, have been supplied by Boving & Co., Ltd.

Among the smaller machines the Francis turbine at Muyuka, Nigeria (1,070 h.p. 300 r.p.m. 11 metres head) was commissioned and the two Pelton turbines for Bega in Australia (1,200 h.p. 1,000 r.p.m. 506 metres head) were erected. An order was also received for three horizontal Francis turbines each of 1,450 h.p. for Port Moresby in New Guinea.

Lightning Protection

TO provide information about the ways in which conductor rod systems should be both designed and installed for the protection against lightning of all kinds of objects in various circumstances the U.S. Bureau of Standards has published a "Code for Protection against Lightning" (price 40 cents, Government Printing Office, Washington, 25, D.C.). This pocket-size 91-page handbook (No. 46), which supersedes former publications on the subject, contains a great deal of useful information and advice, some new rules, detailed specifications and a study of the suitability of aluminium protectors in place of the more usual copper rod systems.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Fused Plugs

FOR some years a domestic fused plug has been made by D.S. PLUGS, LTD., Ordsal Electrical Works, Manchester 5, and in designing a plug to B.S. 1363 the company has ensured that it shall still be possible for the fuse to be changed without the use of tools, as will be seen from the accompanying illustration. The new plug incorporates a patented hinge pin to which the fuse is clipped so that there is no danger of interfering with the wiring when changing a fuse. The fuses, conforming to B.S. 1362 and interchangeable with other makes of terminals, are removable for easy wiring and the plug is available in brown or white moulded material.

The company has also introduced a range of unswitched socket outlets conforming to B.S. 1363—surface type, flush type with plastic front and flush type with metal front plate.

Illuminated Garland Reflectors

A simple, inexpensive garland reflector which can be used with illumination strip and colour sprayed lamps has been produced by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2. The reflectors, which cost 10d each, are silver-finished metal pressed and scalloped to give a brilliant flower-like effect. They fit over the lampholders of the illumination strip and are secured by a spring and rubber gasket, held in position by the lamp. They can also be used on the hardboard cut-outs being offered for Coronation illuminations.

Outdoor Fluorescent Sign

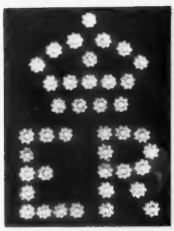
An outdoor fluorescent sign made by SCEMCO, LTD., 6 & 7, Soho Street, London, W.1, is available in two sizes, one for two 3ft 30 W tubes and the other for two 2ft 40 W tubes. These signs are double sided and a patented reflector inside evenly distributes the light. The larger sign is 36in long by 24in deep and the other is 25in long by 24in deep. Both fittings are 9in wide at the top and 1½in at the base and the finish is dark copper bronze.

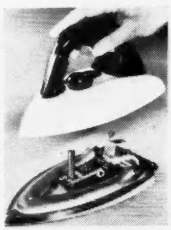
Ignition Timing Light

The ignition timing light offered by NEO ELECTRICAL INDUSTRIES, LTD., 87–89, Corporation Street, Manchester, 4, comprises a black ebonite casing enclosing a specially coiled neon lamp. The 6ft long leads are proof against grease and damp and the connecting clips are provided with rubber cowls making the whole unit completely shockproof.

Lightweight Iron

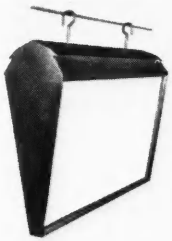
In the new thermostatically controlled iron brought out by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, the heating element is actually embedded in the light alloy sole-plate. The element heats the

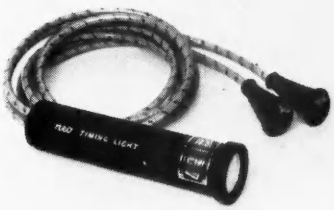


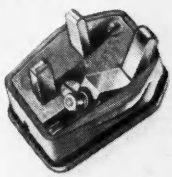


Left: **"Ediswan" hardboard cut-outs fitted with garland reflectors.** *Right:* **G.E.C. lightweight iron**

Left: **Scemco outdoor fluorescent sign.** *Centre:* **Neo ignition timing light.** *Right:* **D.S. fused plug**







entire surface of the sole quickly and evenly, and the thermostatic control, which does not interfere with radio or television, ensures that the iron is kept at the right temperature. The Bakelite handle is comfortable to use and the connection for the 9ft flex is so arranged that the iron can easily be stood on end. The iron, which is finished in a cream coloured vitreous enamel, costs 45s.

Improved Battery Electric Vehicles

It is announced by CONVEYANCER FORK TRUCKS, LTD., Liverpool Road, Warrington, Lancs, that they have introduced an "anti-plugging" system to prevent the drivers of battery electric trucks suddenly applying the forward/reverse control as a means of braking. It is to be a standard fitting on all current models, and available for use on vehicles already sold at a nominal charge.

The system makes it impossible for the driver to misuse the truck, because it must be almost stationary before the motor can be reversed. It is positive in action, and no amount of juggling with the controls can defeat it. In addition to the truck having to slow down to a crawl before a reverse selection becomes effective, the brake pedal must also be depressed.

Domestic Cooker

Cooker manufacturers are very active in the matter of new designs. The latest model to come to our notice is the "R808" of the REVO ELECTRIC CO., LTD., Tipton, Staffs. Low price (£24 6s) is one of the principal attributes of the new model which has overall dimensions of 35¼in high, 21⅜in wide and 16¼in deep and is equipped either with legs or with a plinth (as illustrated). The oven, which has thermostatically controlled 1·9 kW elements, measures 13¼in high by 12¼in wide by 13¼in deep. Below the hob plate is a 5in deep hotcupboard.

The hob is equipped with a 10½in by 8in 2·2 kW grill-boiler with three-heat control and an 8in diameter "Simmerstat"-controlled boiling plate. Optional extras are a 4-heat enclosed plate (5s 9d) or a semi-radiant 3-heat plate (37s). At the back of the hob is a 5in high splash-plate.

The cooker is finished either in mottled pastel grey with white panels or in two-tone ivory.

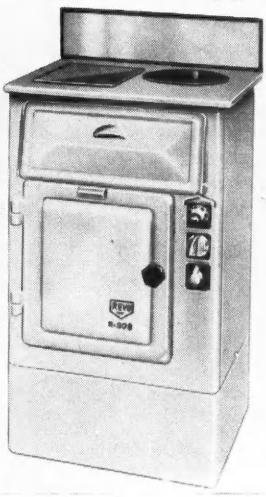
Six-way Plug

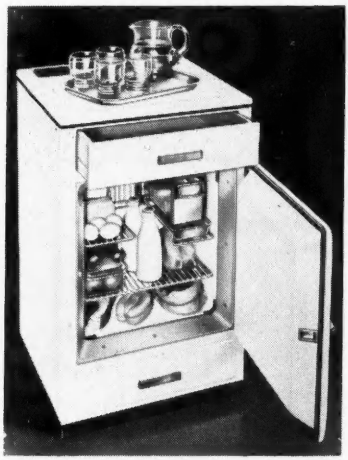
It is announced that the six-way plug made by CRATER PRODUCTS, LTD., The Lye, St. Johns, Woking, Surrey, is on the market once more and in an improved form. Although little larger than a normal three-pin 15 A plug, this accessory contains within its body six different sets of pins to fit all sockets ranging from two-pin 2 A to three-pin 15 A. No tools are required to change the combination.

Cabinet Type Refrigerator

ELECTROLUX, LTD., 153–5, Regent Street, London, W.1, is replacing its model LM. 150 refrigerator by the LH. 150 cabinet model with a table-top and a drawer for kitchen utensils. Measuring 3ft high by 1ft 9½in wide by 1ft 9⅝in deep, it has a capacity of 1½ cu ft and a shelf area of 3½ sq ft. Its price is £42 (plus £21 3s 2d purchase tax in the United Kingdom). Price reductions for other models are also announced and the guarantee has been amended to cover the cooling unit for five years and the controls, heating equipment, and the cabinet for one year.

Left: **Revo "R 808" cooker.** *Below:* **Electrolux LH. 150 refrigerator**





Power Station Design

Reliability and Economy Considered

IN a Supply Section paper presented at a joint ordinary meeting of the Institutions of Electrical and Mechanical Engineers on 5th March, Messrs. S. D. Whetman and A. E. Powell (Merz & McLellan) discussed design features of five power stations commissioned between 1942 and 1951. These stations were designed and partly constructed for different supply undertakings and varied operating conditions before the setting up of the British Electricity Authority in 1947. Reliability and overall economy were the main considerations.

Plant Installed

The stations selected, with their years of design, turbo-alternator ratings and number of boilers, were: Earley, 1940, three 40 MW and seven boilers; Blackwall Point, 1945, three 30 MW and three boilers; Cliff Quay, 1939, six 45 MW and nine boilers; Poole, 1945, four 50 MW and eight boilers; Littlebrook "B," 1938, two 60 MW and four boilers. All burned pulverized coal. The first three had two-cylinder turbines with stop-valve steam conditions of about 600 lb/sq in and 850 deg F; Poole had three-cylinder machines with 900 lb and 925 deg; Littlebrook "B" also had three-cylinder machines but operated at 1,235 lb and 825 deg with reheat to initial temperature and if designed to-day would have only one reheat boiler per machine. For all turbo-alternators except the last two at Poole the most economic rating was 80 per cent of the maximum continuous rating—a design which the authors considered secured greater economy on loads of less than 93 per cent than when the two ratings were the same.

While supervisory gear recording turbine shaft eccentricity and relative axial expansion had proved valuable when bringing sets on to load at Littlebrook "B" and Poole, its expense was considered unwarranted for two-cylinder machines at moderate steam temperatures. Feed pumps were situated at operating floor level for closer supervision and, after Earley, were isolated from vibration by separate steel foundation structures from basement level. Littlebrook "B" was without steam-pump standby and, together with Blackwall Point and Poole, relied on central evaporators because of their independence of fluctuating turbine loads.

The authors submitted that the highest acceptable steam velocity should be used with the corresponding pressure drop, standard allowances for which were below the economic figure.

The three-drum bent-tube boilers (supported entirely from the top of the structure) at Blackwall Point were more representative of present-day design than the straight-tube units at Cliff Quay. Only front and back walls at the former station were of Bailey construction and short-flame burners in the front furnace wall were used instead of long-flame burners fired from near the top of the combustion chamber.

Operation of the hydrogen cooled alternator at Littlebrook "B" (the first in this country) had been entirely satisfactory. Exciters at Poole, as for later larger machines, were gear driven at 1,000 r.p.m. The unit system of auxiliary supply had been adopted in all stations. The arrangement of instrument panels to avoid congestion was among other aspects covered by the paper, which also dealt with operation experience, including turbine starting times, station availability, preliminary troubles and steps taken to improve performance when necessary.

DISCUSSION

Mr. J. D. Peattie (B.E.A.) said that the B.E.A. had to submit, to an extent undreamed of by its predecessors, to post-war controls and restrictions. The development of steam cycles had been held up by the war with its concentration on survival rather than on pioneering, but progress was now being made. Transport charges were an important factor in cost, and the availability of fuel varied from month to

month. Increased efficiency was sometimes attributed wholly to the adoption of advanced steam conditions, but it was also due partly to the elimination of working losses by designers, constructors and operators.

Mr. I. V. Robinson (B.E.A.M.A.) noted that all five stations mentioned were equipped with plant of different capacities. The tendency to-day was to limit the sizes to 30, 60 and 100 MW, all of the reheat type. Full consideration was given by a committee of the International Electrotechnical Commission to the appropriate sizes and operating conditions of turbines working on a reheat cycle. It was ultimately decided that only three ratings were required—120, 80 and 60 MW. In this country only 120 MW was needed. The recommended steam conditions were 1,500 lb/sq in with an initial temperature of 1,000 deg F for all three sizes.

Mr. F. J. Hutchinson (Kennedy & Donkin) said the selection of the five stations appeared to have been made from a restricted field. Information on the reconstruction of the Portobello power station in Edinburgh would have been interesting. With regard to economic rating he thought that engineers who took a long view would agree that for a twenty or thirty year life it should be fixed at a point below 100 per cent.

Mr. P. Pochobradsky (G.E.C.) said that while he had no reason to dispute what the authors said about the by-pass machine with 925 deg, he thought that with high temperatures and high pressures only long experience over many years could serve as a reliable guide.

Mr. C. E. H. Verity (B.E.A.) asked whether the method adopted for the main foundations at Poole where mass concrete was used was not too expensive. It might have been better, he thought, to use piles driven straight down into the clay.

Mr. L. C. Southcott considered that the curve for boiler and turbine starting times might be unduly simplified, conveying the impression that there was little difficulty in placing boilers and turbines in commission in a comparatively short time.

Mr. T. Smeaton (International Combustion, Ltd.) said that Earley was unique in being an adaptation of an existing design for a substantially different class of fuel. Nevertheless the operating returns were satisfactory.

Mr. J. S. Hall (Metropolitan-Vickers Electrical Co., Ltd.) commented on the expression "thermal instability" which conjured up a picture of a fish jumping about in a frying-pan. All it meant was that annealing tended to take place as a result of steam temperature. Present practice was to give the rotor a good "cooking" in its nearly finished condition to prevent annealing of this kind.

Mr. H. W. Puttick said that there was too much complacency about the discussion. Progress in this field had been very slow as compared with progress in, for instance, diesel engines, motor cars, or aeroplane engines.

Mr. Twynham (English Electric Co., Ltd.) asked what the authors thought about loosening up the instruments and including not only vibration instruments on pedestals but also introducing a pedestal extension for the turbine.

Mr. D. Clark (B.E.A.) described some difficulties at Earley with a de-aerator and said that the present B.E.A. practice was to provide for make-up water to be admitted to the condenser automatically without any hand control. There was a second line of defence in the series de-aerator which operated under pressure.

Dr. R. J. Eldred (Merz & McLellan) said it was unfortunate that machines were priced on the maximum rather than the economic rating, although they were designed on the latter. Price based on economic rating would give a better picture and far more machines with overload ratings would become available.

Mr. G. R. Peterson (B.E.A.) said that station availability would appear from the figures to differ considerably from one station to another. Further explanation was required.

Mr. P. V. Morgan said it would appear from the figures for pressure drop and cost of piping that 50 lb/sq in was justified for 900 deg and 25 lb/sq in for 600 deg.

New Italian Power Station

A new power station at Naples capable of producing 500 million kWh a year was officially inaugurated on 3rd March by the Prime Minister of Italy, Signor de Gasperi. The station has cost 12,000 million lire (about £7 million) and has been financed mostly by American aid funds. Mr. Ellsworth Bunker, the American Ambassador, attended the opening ceremony.—*Reuter.*

Electricity Production in Spain

Exploitation of Water Power Resources

IN a recent lecture on electric power supply in Spain, Mr. J. M. Ruiz-Morales (Economic Counsellor to the Spanish Embassy) gave an account of recent developments and future projects in the seven electrical regions of Spain for meeting a demand for electricity that is increasing at the rate of 8 per cent per annum. Last year, he said, 10,000 million kWh was generated compared with 5,500 million in 1946, during which time the installed plant capacity was increased from 2,200 to 3,200 MW.

Three-quarters of the plant was hydro-electric and accounted for over 90 per cent of the output, the remainder being supplied by steam stations using low grade coal unsuitable for other purposes. The capacity of the latter had been increased in the past four years by about one-third to 800 MW, but future production would be based mainly on water power, 30 per cent of the economically usable resources of which were now exploited, whereas only 12 million tons of coal was mined annually. The steam stations had been most useful in years of drought, as in 1949 when, with a fall in output of the hydro stations of 25 per cent, the total output was less by 8 per cent. Fuel was pulverized at the pit-head.

Heaviest industrial consumption of electricity was in the Basque Provinces, for which power was transmitted, as it was to Catalonia also, from the Pyrenees, but the resources of mountainous Galicia and the River Duero were being developed and regulated by dams and reservoirs. The largest hydro station at present was at Esla (Zamora Province) of the Duero system (148 MVA and 430 million kWh per annum), which was commissioned in 1939. Stations of over 20 MVA completed between 1948 and 1950 were: Las Conchas (Orense), 210 MVA; Villalcampo (Zamora), 96 MVA; and Sequeires (Orense) 25 MVA. Stations under construction for the Sil-Mino and Duero schemes with completion dates included: Montefurado (Orense), 1956, 48 MVA; San Esteban (Orense), 1957, 300 MVA; Ponte Novo (Orense), 1953–56, 48 MVA; Los Peares (Luzi), 1953–55, 180 MVA; Castro (Zamora), 1953, 84 MVA; and Sancelle (Salamanca), 1957, 180 MVA. Sixteen further stations were projected for these two schemes, but completion dates had not yet been fixed; their aggregate installed capacity would be nearly 850 MVA and the largest would be Alcadavila (Salamanca), 450 MVA, followed by Belesar (Lugi), 225 MVA.

Transmission would be by 220 kV extensions in the form of a " St. Andrew's cross " from Bilbao to Madrid and Seville. Elsewhere the system was at 110 or 132 kV and steps were being taken to electrify the more thinly populated south of the country. The present annual consumption of electricity per head of population in Spain was 350 kWh.

Birmingham Electric Club

THE important role played by the Birmingham Electric Club was emphasized at its annual dinner at the Grand Hotel, Birmingham, last Friday. Proposing the toast of the Club, the Lord Mayor of Birmingham, Alderman W. T. Bowen, said that, apart from its social activities, since its foundation in 1904 the Club had had over 300 papers and lectures presented to it. Dedicated to the task of mutual enlightenment, its 650 members had made a valuable collective contribution to the electrical industry of this country.

In reply, Mr. C. F. Peirson, the president, said that the Club was the largest and oldest of its type in the world. They were now planning a jubilee celebration for the autumn of next year. The Club fulfilled a definite need in providing a forum for the presentation of papers in an atmosphere freer than that of other technical and scientific institutions.

Responding to the toast of the guests, proposed by Mr. C. F. Partridge, senior vice-president of the Club, Sir Vincent Z. de Ferranti, past president of the Institution of Electrical Engineers, said that he hoped that from now on more electricity would be sold for every conceivable purpose in the home, factory and everywhere else. The use of electricity enabled many times the amount of work to be done with the same effort.

NEW BOOKS

Essentials of Microwaves. By Robert B. Muchmore. Pp. 236; figs. 201; index. Chapman & Hall, Ltd., 37, Essex Street, W.C.2. Price 36s in U.K.

The aim of this book is to stress the physical concepts that underlie the operation of all microwave devices. A few basic formulæ, such as Maxwell's equations, are given in mathematical symbols, but there is no mathematical manipulation in the book. Results are stated and not derived. All the major topics of microwave physics are included, i.e., waves and wave guides, cavity resonators, aerials; valves, including klystrons, travelling wave tubes and magnetrons, and noise. Chapters then follow on microwave relay systems, radar and the use of microwaves in research. A final chapter deals with measurements. Clear line drawings give a good idea of current microwave technique.

The book is interesting and represents a determined and honest attempt to carry out the author's aim. It is a work which demands serious attention, as there must be many people who would like to study microwaves in such a way. But one has to enquire whether or not this is possible. Some parts of microwave physics, especially the behaviour of wave fields, can be handled effectively by pictorial means. Electron ballistics and noise are in a different category and it is doubtful whether the explanations of travelling wave tube operation or shot noise really tell one anything useful. Opinions on this will differ and the book should appeal to anyone requiring an introduction to microwaves.—A.H.B.

Dictionnaire Anglais-Français des Termes Relatifs à l'Electrotechniques, l'Electronique et aux Applications Connexes. By H. Piraux. Pp. 296. Éditions Eyrolles, 61, Boulevard St. Germain, Paris V.

In presenting this dictionary the author has provided a means of solving many irritating problems. It contains more than 20,000 words and expressions and is devoted to electrical engineering, electronics, radio, television, acoustics, optics, lighting, cinematography, telegraphy, telephony, nucleonics and so on. Not only is the proper translation of each word given but also the popular or slang expression used in daily work, which is often baffling to the foreigner.

The author has taken care to give as far as possible the standardized names. On the French side, the standards are those of the Comité Electrotechnique Français, and in the English language those of the British Standards Institution, the American Standards Association and the American Institute of Radio Engineers. The final pages of the book are devoted to conversion tables between English, American and metric measures.—R.P.

Books Received

Alternating Current Wave-Forms. By Philip Kemp. Second edition. Pp. 406; figs. 170; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2.

Home Mechanic's TV Servicing. By W. R. Wellman and J. J. Kadrle. Pp. 159, figs. 66; index. MacMillan & Co., Ltd.; St. Martin's Street, London, W.C.2. Price 21s.

Technical Writing Premiums

THE Radio Industry Council announces six further awards of premiums under its scheme for encouraging good technical writing. Full awards of 25 guineas go to Messrs. P. H. Parkin, B.Sc., A.M.I.E.E. and J. H. Taylor, A.M.I.E.E. (article in the *Wireless World*); Messrs. T. Somerville, B.Sc., M.I.E.E. and C. L. S. Gilford, M.Sc. (article in the *B.B.C. Quarterly*); Messrs. J. A. Jenkins, M.A. and R. A. Chippendale, B.Sc. (article in *Electronic Engineering*); and Mr. W. R. Stamp (article in *Discovery*). Ex gratia awards of £10 each were made to Mr. T. W. Bennington (article in *Wireless World*) and Mr. G. N. Patchett, Ph.D., B.Sc. (article in *Wireless World*).

The new awards will be presented at a luncheon of the Public Relations Committee of the Council at the Café Royal, Regent Street, W.1, on 9th April.

One of the judges, Vice-Admiral Dorling, director of the R.I.C., in announcing the awards said that a principal consideration is how far an article made known new and interesting developments in radio, television and electronics in Great Britain, not only to engineers and those engaged on technical work, but also to executives and administrators. For this purpose it was almost essential to start a highly technical article with a simple concise explanation of the aims and applications of the techniques described and, when possible, an indication of any economic advantages.

COMMERCE and INDUSTRY

Encouraging Productivity

African Broadcasting Developments

A RECENT Government White Paper has announced agreement between the Governments of the United Kingdom and the United States on the allocation of about £3,000,000 "counterpart funds" arising from the operation of the M.S.A. Economic Aid scheme. Under the general direction of the President of the Board of Trade, this money will be devoted over a period of two to three years to schemes associated with efforts to increase productivity and designed "to assist in the provision of services by which industry can help itself, to promote research necessary for this purpose, to make what provision it can to give industry encouragement to raise its efficiency, and to provide for co-operative action between Government, management and labour, so as to enable industry to raise the national production to new heights."

Machine Tool Productivity

The Machine Tool Trades Association has appointed a committee to study the Metal-working Productivity Team Report recently issued. In the meantime, attention is drawn to the fact that the recommendations, conclusions and views in the report are put forward by the team for consideration and discussion and are not necessarily to be regarded as being endorsed by the machine tool industry, the Machine Tool Trades Association or the concerns who lent the services of the members of the team.

Mobile Butchers' Shop

A two-ton N.C.B. vehicle built by Smith's Electric Vehicles, Ltd., and fitted out to meet the special conditions of the trade, is now being operated by R. Stoddard & Sons, Ltd., pork butchers, of Birmingham. Covering 25 miles a day, five days a week, the mobile shop serves two municipal housing estates at Shard End and Garretts Green, where the nearest permanent shopping centre is two miles away. Besides supplying the normal range of pork butchers' products, the vehicle also carries comprehensive stocks of tinned and bottled goods and other heavy groceries as well as fresh frozen vegetables, fruits, fish and meat.

The electric vehicle, chosen by R. Stoddard & Sons, Ltd., because of its freedom from heat, dirt and exhaust fumes, was supplied through Electric Vehicle Service (Birmingham), Ltd. Powered by a 36-cell Exide-Ironclad battery of 323 Ah capacity, it measures 15ft 9in by 6ft 7½in wide overall and weighs 4½ tons when loaded. Two large refrigerated cupboards for frozen foods are situated behind a "Formica" topped counter fitted at one end with a slicing machine and at the other with a special set of self-levelling scales. The vehicle is also fitted with a hot water storage tank and wash basin. Fluorescent lighting is employed and an extractor fan helps to keep the air fresh.

A mobile butchers' shop operating in the Birmingham area

Extensions at C. A. Parsons' Works

The new research and design building erected at the Newcastle-on-Tyne works of C. A. Parsons & Co., Ltd., will be completed in April. This 185,000 sq ft building is one of the largest constructed in Great Britain during the past year or two and has been built in record time. The new building is part of a £4,000,000 development scheme carried out by Parsons since 1946. During this time output of turbo-alternators has been more than doubled and of transformers increased six-fold.

Broadcasting in Africa

As part of the scheme for development of Colonial and other overseas territories, local sound broadcasting facilities are being extended and augmented. Transmitter and studio equipment for these extensions in Nigeria, Kenya, Uganda, Tanganyika and the Gold Coast have been ordered from Marconi's Wireless Telegraph Co., Ltd., by the Crown Agents for the Colonies. African Information Services, the official broadcasting authority in Kenya, will

have two new studios in Nairobi. Portable equipment for outside broadcasting has already been supplied to Nairobi. Extensions at Accra on the Gold Coast for the Public Relations Department include a 20 kW h.f. broadcast transmitter to supplement the two existing transmitters of lower power, four complete studios and a continuity suite for co-ordination of programmes. Each studio control room will have heavy duty disc reproducers incorporating optical groove locators. High frequency transmitters for local coverage will supplement those on existing sites in Uganda (one 7½ kW), in Nigeria at Lagos (one 20 kW), at Enugu (one 2½ kW), at Kaduna (one 7½ kW) and in Tanganyika at Dar-es-Salaam (one 20 kW).

Pictorial Advertising Matter Tax

The Commissioners of Customs and Excise have reviewed the liability of pictorial advertising matter generally under Group 25 of the Tax Schedule, which relates to pictures, prints and similar articles, of a kind produced in quantity for general sale, and have decided that, in future, pictorial articles which bear advertising letterpress and are for distribution gratis, can be regarded as not "of a kind produced in quantity for general sale" and, accordingly, as not chargeable with tax under Group 25. Articles affected by this decision which are within other Groups will be taxable thereunder, e.g., advertising calendars and blotters under Group 34 (stationery, etc.) and articles with manipulative play features under Group 20 (toys, etc.), but posters (except poster blanks) will be free of tax.

Home Workers' Examiners' Course

Interest in the E.A.W. home workers' course is continually increasing and the need for more examiners and lecturers is evident. In order to ensure uniformity in the method of giving the instruction and carrying out the examination, electrical housecraft advisers and demonstrators spent a week-end at Horsley Towers by permission of the British Electricity Authority. In opening the conference Dame Caroline Haslett called on Mr. J. W. Graely, the resident tutor, who welcomed the students to the Horsley Towers Training Establishment. Lectures and demonstrations were given by Miss Pilkington (South East Scotland Electricity Board), Miss Holt (Lancashire County Education Committee), Mrs. Falconer and Mrs. Hayes (E.A.W. area organizers). The conference was organized by Miss V. Norvick and Miss E. Mulligan.

Marryat & Scott Acquisition

Marryat & Scott, Ltd., have acquired the shares of Marris's Engineers, Ltd., 15, Tithebarn Street, Liverpool. Marryat & Scott, Ltd., is one of the operating companies of the Marryat & Scott Holdings, Ltd., group, and Marris's Engineers, Ltd., have acted as agents for Marryat & Scott for the last twenty years. The Liverpool company will continue to give sales and service for lifts in Lancashire and the staff has been strengthened by the appointment of a general manager, trained at headquarters.

Pakistan's Import Cuts

A *Reuter* report from Karachi says that the Pakistan Government has announced a ban on imports from the dollar area, including engineering and electrical equipment and radio sets. The classes of goods affected may still be imported, under licence, from the non-dollar areas and Japan.

Plastics Year Book

The British Plastics Year Book is claimed to be the only classified guide to the products of Britain's plastics industry. The 1953 edition, which is now available, has more than 550 pages and is divided into nine sections, three of which are given to classified lists of manufacturers of plastics materials, products and equipment. A further section contains a list of proprietary names connected with plastics, defining the product and listing the manufacturers. Linked with the classified guides

Electrical housecraft advisers and demonstrators at Horsley Towers. Seated in the centre are Mr. J. W. Graely (resident tutor, Horsley Towers), Dame Caroline Haslett and Miss V. Norvick

and proprietary names list is a directory of manufacturers containing more than 3,500 important firms and their addresses; and in addition, a " Who's Who " section includes the names of all the prominent figures in the plastics industry.

Other features are an annual review of patents, a list of companies registered during the past year and technical and general data.

The Year Book is published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, at 30s (postage 1s 3d).

Outlet Positions

In the March *Electrical Contractor and Retailer* Mr. W. A. Gazard comments on a letter which appeared in the *Electrical Review* of 16th January deploring the tendency to fit socket-outlets on skirtings. The writer, Mr. V. J. Simson, attributed this to " a reluctance in the past on the part of wiremen and contractors to suggest positions other than on the skirting, because of the ease of fitting on to the skirting." Mr. Gazard says:—

> " It should be known by now that electrical contractors do not go round telling their customers where the sockets are to be fixed. Neither do they fix things in the easiest possible way, regardless of the comfort of the man who is paying for them. The electrical contractor combines making a profit with providing a service and that means fixing socket-outlets and things where the customer wants them to be fixed."

The P.O.A. " Minibition "

The " Minibition," to be held during the National Conference of the Purchasing Officers' Association at Brighton from 24th to 26th September, is designed so that the maximum information regarding exhibitors' products can be displayed attractively and economically. The stands, all of one size, will be situated adjacent to the main conference hall. The membership of the Association, exceeding 3,000, covers the whole field of industrial and public undertakings. A new feature this year will be a competition to decide the best three displays, based on the educational nature of the exhibits and the attractiveness of their layout. All conference members will be given voting forms to enable them to take part in selecting the winning exhibitors.

Educational

The University of Birmingham is holding a course on " The Theory of Electrical Communication " from 20th to 25th July at the Centre for Continued Studies, Primrose Hill, Selly Oak, Birmingham. The fee for the course is £3, and applications for enrolment should be made to the Director of Extra-Mural Studies, The University, Edmund Street, Birmingham.

A course of six lectures on " Electric Strain Gauges " will be given by Mr. S. A. Andrews, of A. Napier & Son, Ltd., at the South East London Technical College, Lewisham Way, London, S.E.4, on Thursday evenings, commencing on 16th April. Applications for admission to the course should be made to Mr. C. W. Robson, head of the Department of Electrical Engineering of the College.

The London and Home Counties Regional Advisory Council for Higher Technological Education has published " Engineering Education in the Region," setting out various engineering courses together with a list of colleges in the area in which these courses are held. The booklet can be obtained from the Council at Tavistock House South, Tavistock Square, London, W.C.1, price 1s.

Football by Floodlight

The first football match by floodlight to be played on the ground of Portsmouth Football Club at Fratton Park took place on 2nd March when the Southampton team were the visitors. The floodlighting equipment has been supplied by the Simplex Electric Co., Ltd., and eighty of their general purpose floodlights are installed on 70ft high towers. Each tower has twenty floodlights arranged in five horizontal groupings of four floodlights each. The top three groups of four floodlights each are Simplex LS.53 type which give a narrow beam light. The remaining two rows of four floodlights each are LS.55's which provide a wide angle light. Each floodlight has a 1,000 W class B projector lamp. All the switch and distribution gear installed with the floodlighting equipment is also of Simplex manufacture. The installation was carried out by the Haslemere Radio & Electrical Co., Ltd., Portsmouth.

Welding Instruction Courses

In addition to courses for welding operators and for designers and draughtsmen, the Quasi-Arc Co., Ltd., runs courses lasting for three weeks for welding engineers, supervisors, inspectors and foremen. About half the time is allotted to technical and theoretical work and half to practical welding experience. The lectures are illustrated by lantern slides and films.

The next course will commence on 13th July and there is a further course commencing on 5th October. Applications for enrolment should be sent to the company at Bilston, Staffs or Bridgewater House, Cleveland Row, St. James's, London, S.W.1. Local accommodation can be arranged near the Bilston Works.

Industrial Art Awards

The Royal Society of Arts has announced the awards in its 1952 Industrial Art Bursaries Competition. In the domestic electrical appliances section a bursary (£150) has been awarded to Mr. Geoffrey Gale (L.C.C. Central School of Arts and Crafts), while Mr. J. W. Cooper of the same school has been commended. A £150

bursary has been awarded in the electric light fittings section to Mr. Leonard Summers (Birmingham College of Arts and Crafts) who has also been made an associate member of the Society. Commended in this section were Mr. R. W. Saxby (S.E. Essex Technical College), Miss Jean Challis (Kingston School of Art), Mr. W. B. Holdaway (Kingston School of Art) and Mr. A. H. Tilbury (Kingston School of Art).

An exhibition of winning and commended designs is to be held at the Society's premises from 11th to 22nd May.

"Evershed News"

We have received from Evershed & Vignoles, Ltd., a copy of the first number of "Evershed News," which is intended to provide a link between the company's employees, dealers, agents and customers. This issue includes some personal notes, brief articles dealing with applications of the company's instruments and an article on "Megger" insulation testers. There is a liberal use of pictures.

Power Station Overtime Ban

About 100 men employed at power stations on Tyneside have banned overtime because they complain that recent wage increases granted to unskilled men have brought their earnings too near to those of skilled men. Seventy men are involved at Dunston power station, 20 at Carville power station and the others at South Shields. In some cases, it is stated, the wages of skilled men are only ½d/hour more than unskilled workers. According to Mr. J. B. Jackson, chief generating engineer (operation) of the North Eastern Division, B.E.A., the ban will not affect output. Although the men were supported by the local officials of the Amalgamated Engineering Union they had not had the backing of the Union's national executive. Mr. Jackson said that the present schedule of wage rates had been negotiated between the B.E.A. and the A.E.U. on a national basis.

Trade Announcements

A hire purchase scheme has been arranged by the **Hotpoint Electric Appliance Co., Ltd.**, with the Mercantile Credit Co., Ltd., by which dealers can offer customers hire purchase terms for all the larger Hotpoint appliances.

We regret that in our issue of 27th February we incorrectly stated that Drake & Gorham, Ltd., had moved their Manchester Branch to 53, Sackville Street, Manchester, 1. This is the new address of the Manchester Branch of **Drake & Gorham Wholesale, Ltd.** Drake & Gorham, Ltd., are, of course, at 36, Grosvenor Gardens, London, S.W.1. The address of the Manchester Branch of **Drake & Gorham (Contractors), Ltd.**, is 21, Newton Street, Manchester.

From 16th March the address of **W. E. Beardsall & Co., Ltd.**, will be 34, London Road, Manchester, 1 (telephone : Central 7861). This will be the registered head office, and only address. A spacious trade counter and two showrooms are available for the use of the trade.

J. H. Tucker & Co., Ltd., have appointed Mr. Walter S. Mercer, 20, Bedford Street, Belfast (telephone 21424), as their agent for Northern Ireland in succession to Mr. A. M. Wedderburn.

The Sales Divisions of **R. H. Windsor, Ltd.**, plastics machinery manufacturers, have been transferred to the company's head office and works at Leatherhead Road, Chessington, Surrey. The telephone number has been changed to Epsom 5631.

Wolf Electric Tools, Ltd., has opened a new office and service depot at Leeds to replace the previous service depot at 2, Park Square, Leeds. The new premises are at 405, York Road, Leeds, 9, and are under the direction of Mr. D. S. Powell. This new branch will serve the Yorks, Lincs, Derby and Notts area for which Mr. F. L. Gibson is the area representative.

Catalogues and Lists

G.W.B. Electric Furnaces, Ltd., Electfurn Works, Watford By-Pass, Watford, Herts.—12-page technical catalogue on "Autolec" electrode steam raisers.

David Brown Companies, Meltham, Yorks.—Technical leaflet on the "Radicon" double reduction, worm-reducing units.

Zenith Electric Co., Ltd., Zenith Works, Villiers Road, Willesden Green, London, N.W.2.—Catalogue relating to the "Zenith" automatic voltage regulators with electronic control.

Bailey Meters & Controls, Ltd., Progress Way, Croydon, Surrey.—Illustrated leaflet on the "Bailey" automatic control for spreader stokers (E.1022).

English Electric Co., Ltd., Marconi House, 336/7, Strand, London, W.C.2.—Illustrated brochure describing the Tekapo hydro-electric plant in New Zealand (HE/124).

Lumsden Lamp Co., Millburn, Almondbank, Perth.—Illustrated catalogue of "Lumsden" health lamps (273) together with price list (275).

Brush Electrical Engineering Co., Loughborough, Leics.—Three new publications dealing with the Brush 33/38.5 kV outdoor circuit breaker including a description of operating mechanisms (41166), type VA air-insulated vertical draw-out pattern metalclad switchgear (41002/1) and Brush induction motors from 1 to 80 b.h.p. (11002).

ELECTRICITY SUPPLY

Standard Farming and Horticultural Tariff

South Wales Power Station Site

THE Southern Electricity Board has adopted a standard tariff for unrestricted supplies to farms and horticultural premises which will come into effect after 1st April. It will take the place of more than 100 different existing tariffs. Farmhouses will be supplied on the standard domestic tariff already in force. Under the new tariff there will be a charge of 5½d/kWh for an initial block the size of which will be dependent upon the lighting, heating and power installations at the premises, and all additional consumption will be charged at 1d kWh. The tariff is of a form recommended for national application by a joint committee of the British Electricity Authority and all Area Boards and, in order to meet recent increases in the cost of electricity purchased and in salaries and wages, it has been fixed at a level which will yield in total an additional revenue of 12½ per cent. The effects, however, will vary and it is estimated that some 37 per cent of the consumers concerned will pay less than at present. The largest decreases will, in general, occur in the case of premises formerly supplied at high flat rates, while the larger increases will apply where extensive heating and motive power were supplied at rates which made little or no provision for the standing charges attributable to the load.

Inquiry into South Wales Scheme

Choice of a 138 acre site at Machen, Monmouthshire, for the erection of a new power station was the subject of recent public inquiry by the Ministry of Fuel and Power. Among the objectors to the scheme were the Monmouthshire County Council, Magor and St. Mellons R.D.C., Machen U.D.C., the National Farmers' Union and the Council for the Preservation of Rural Wales. On behalf of the British Electricity Authority, Mr. J. R. Willis said that since the war the electricity demand in South Wales had increased by 79 per cent compared with the national figure of 69 per cent. The B.E.A. realized that the rural scene at Machen was bound to be damaged by the construction of the power station, but by sympathetic landscaping and tree-planting the worst effects would be avoided. No alternative site could be found where the basic requirements were fulfilled.

Referring to the "apprehension about dust and soot," Mr. D. Clark, station development engineer, B.E.A., said that the fears were based on a misconception. What he visualized was just a grey haze from the chimney top. Asked why the station could not be built next to the present Uskmouth power station, he said that it would cost £30,000 a year more and the station would be farther away from the coalfields and from the demand centre. Moreover, the Authority wanted to avoid the undue concentration of power in one place.

Future of Southampton Station

Speaking at a public inquiry into Southampton's development plan, Mr. J. H. Geach, for the British Electricity Authority, said that the Western Esplanade power station was in an area zoned for recreational purposes, but it could not be definitely stated that even after 30 years the plant would be time-expired. If it were decided in the future to remove the generating station the substation would still be needed, being the focal distribution point for the town. It was possible that some new equipment, including overhead lines, might be installed. He suggested that the area should be zoned for industrial purposes.

For the Corporation, Mr. R. J. Coles, senior planning officer, said it was the first time that he had heard any suggestion of installing new equipment. The Corporation was not prepared to include any provision in the plan for the station to remain on its present site permanently.

Ownership of Property

In 1938 Brighton Town Council purchased the freehold of property in Cheapside for the municipal electricity undertaking, but in the same year appropriated part of the premises for educational purposes to provide accommodation for a school caretaker. An electricity substation was built on the part which was not appropriated. When the undertaking was nationalized, it was inadvertently assumed by both the Town Council and the South Eastern Electricity Board that the whole of the property was vested in the Board. The Town Clerk has recently looked into the matter and it has been agreed with the Board that, in fact, the part of the premises appropriated for educational purposes

did not vest in the Board. An agreement is to be completed with the Board recording the position and embodying other consequential matters.

Variation of Line Route

The British Electricity Authority has agreed to an adjustment of the route of the proposed 275 kV line from Stella (near Newcastle-on-Tyne) to Carlisle, a distance of about 60 miles. The adjustment will be made in South-West Northumberland where farmers complained that the proposed line would traverse good agricultural land. The towers will now be placed across rough pasture land and instead of being silhouetted against the skyline will have a background of hills. The adjustment, which has also been approved by the amenity societies who had objected to the original route, will make very little difference to the cost of the line.

Ulster Hydro-Electric Scheme

Plans for harnessing the River Bann at Carnroe, near Kilrea, have now been completed by hydro-electric engineers surveying Northern Ireland's water-power resources. The Ulster Ministry of Commerce is considering the scheme, and an order to embark on the initial operations may shortly be issued. The possibilities of a station on the Mourne at Sion Mills are also being investigated. If the proposed schemes are embarked upon they will be the first to add water-power to the Province-wide grid operated by the Electricity Board for Northern Ireland. It is estimated that the Bann and Mourne together can provide up to 20,000 kW.

Rural Supplies in Ireland

The Killavullen area of Co. Cork is the latest rural area to receive electricity. It comprises 23 sq miles, and 317 farms and other premises will be connected. The village of Killavullen is on the main road from Mallow to Fermoy. The project has cost £34,000.

Transfer of N.C.B. Network

The North Eastern Electricity Board has made arrangements for taking over from the National Coal Board the network supplying Murton, Dalton-le-Dale and Hesleden. In order to improve the supply it is proposed to build several new substations with h.v. feeders, construct new l.v. lines and reconstruct existing l.v. lines. The improvements will take nine months to carry out.

Damodar Station Opened

On 21st February the Prime Minister of India (Mr. Nehru) officially inaugurated the Bokaro thermal power station and the Tilaiya dam, part of the Damodar Valley power and irrigation scheme on the Bengal–Bihar border. The new station, with a capacity of 150 MW (ultimately 200 MW), has been built to even out the seasonal fluctuations of hydro-electric power and provide firm power of 300 MW at 60 per cent load factor.

It utilizes low-grade fuel from the Bermo coalfield which is carried 6 miles to the station by a ropeway. The boiler plant is designed to take fuel having a maximum ash content of 30 per cent and operate at 900 lb/sq in. The Tilaiya all-concrete dam across the Barakar River is 112ft high and 1,147ft long.

Concession Discontinued

Complaint of " arbitrary treatment " by the East Midlands Electricity Board is being made at Loughborough (Leicestershire), where a concession rate for old people's homes has been discontinued. The Corporation Welfare Committee is planning a gas supply in its place, and thinks the facts ought to be reported to the local M.P. The Board said it could no longer continue the concession, which affected twenty-four old people's homes, because of standardization of the domestic tariff. The concession was granted by the municipal electricity undertaking in 1933, and its discontinuance will add a shilling a week to the rents to be met by the Council.

Coronation Illumination Tariff

The London Electricity Board has been asked by the twenty-eight metropolitan boroughs to provide electricity free of charge for public floodlighting and illuminations for the Coronation celebrations. It has replied that it is unable to do this, but is prepared to offer to local authorities and private traders the same terms as for the Festival of Britain, namely, 1d kWh from 1st May to 31st October. Supply on special circuits is not to be taken between 7 a.m. and 6 p.m.

Middlesbrough Corporation has accepted estimates submitted by the North Eastern Electricity Board for floodlighting of the Town Hall and Municipal Buildings and other ornamental lighting to mark the Coronation. The cost will be about £1,500.

Council House Services

The Heywood Housing Committee has recommended the Town Council not to agree to the North Western Electricity Board's request that electric cookers should be installed in half of the new houses erected by the Council.

Street Lighting Schemes

HINCKLEY U.D.C. proposes to spend £9,472 on converting further street lamps from gas to electricity during the coming year. Additional street lamps are to be erected on the new housing estates.

CROYDON Highways and Street Services Committee recommends that for the lighting of the Sylvan Hill estate 30 standards shall be erected with 45 W sodium lamps and Revo lanterns at an estimated cost of £1,599.

Infra-Red Radiation

Industrial Drying Applications

As manufacturers of infra-red radiation equipment the Metropolitan-Vickers Electrical Co., Ltd., have done much to develop the applications of this modern heat penetration method of drying throughout industry. The following notes are taken from a report of an investigation by the company mainly within the automobile production industry in which the infra-red method is becoming increasingly popular, largely because of the trend to change over to synthetic polymerizing paints which appear to afford harder and more durable finishes. The greater penetration of the infra-red radiation ensures better adhesion and more complete removal of solvents. Infra-red radiation is similar to light in that it may be absorbed, transmitted, reflected and refracted according to the waveband covered by the radiation and the physical characteristics of the material receiving it.

Though much of the heat produced by this form of paint stoving is generated in the paint film, some is generated in the underlying metal and passes to the paint by conduction, and this has given rise to statements that " infra-red heats from the inside out " which, of course, is only partially true. In an infra-red oven the radiation is directed towards the object to be heated by means of suitably shaped reflectors made from a metal chosen for its power to reflect highly radiation within the waveband concerned, and these reflectors also serve to re-direct the radiation reflected from the object. Infra-red is radiated by all heated substances, but the intensity of this radiation for a given body is proportional to the fourth power of its absolute temperature, so that a radiant heat source of say 750 deg C, such as the infra-red element, will have a high rate of heat transfer towards a body at say 20 deg C, providing the latter is not highly reflective. And since in the majority of infra-red heating applications the temperature of the receiving body is not required to be raised to a temperature exceeding about 200 deg C, the rate of heat transfer from a source at 750 deg C would still be high at the end of the heating period.

Electricity as a source of infra-red has the immediate advantage of complete and direct conversion into heat at 100 per cent efficiency. There are no harmful waste products, nor any particular hazards, while the radiation is under complete control at all times. Furthermore, the load provided by an infra-red plant at unity power factor is often a useful means of materially improving a factory's overall power factor.

The heating element consists of a high-purity magnesium tube contained in an outer sheath of a non-scaling, non-corrodible alloy, while within the tube is a helical coil of the highest grade heat-resisting wire, the

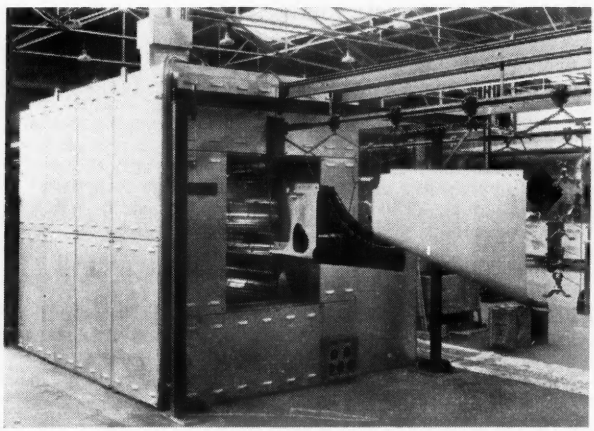
Above : **An installation for speeding-up the drying of nitro-cellulose and spirit varnishes consists of four infra-red ovens arranged in two pairs**

magnesium being wholly converted by a special process into solidly packed magnesium oxide, thus ensuring perfect centralization of the spiral in the bore and an even thickness of insulation separating the spiral from the sheath. The projectors, in which the elements are mounted, are made in three standard sizes of 18in, 24in and 36in long for convenience in installing them for bank operation. The trough reflector is constructed from high-grade aluminium sheet which is anodized to ensure maximum heat reflection and to protect the surface from atmospheric corrosion. The reflector is mounted in a sturdy frame designed for maximum strength consistent with reasonably low weight. Projectors intended for incorporation in enclosed ovens can be supplied with open frames with detachable perforated metal sides and ends. The radiating units can be mounted in various ways to suit the shape of the work; for example, they may be butted end-to-end to form a continuous trough, assembled in angular formation, or they may be built very easily into enclosed plants.

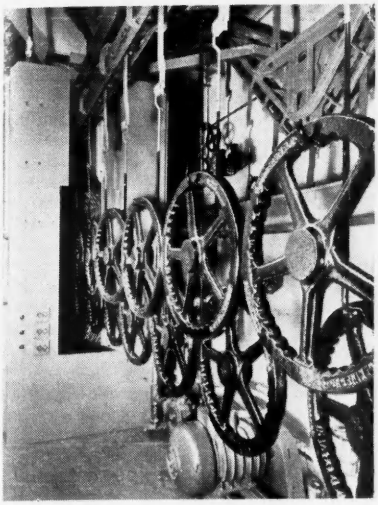
Plant for paint stoving No. 20 gauge aluminium panels for buses incorporates a bank of projectors on a wheeled track facing a reflecting surface

Infra-red stoving also offers useful service to the motor car industry for speeding-up the drying of nitro-cellulose and spirit varnishes, and an installation for this and similar purposes at the Luton works of Vauxhall Motors, Ltd., consists of four infra-red ovens arranged in two pairs. On completion of assembly the car is driven on to a floor-level chain conveyor which carries the car through a washing booth in which jets of water impinge on the car, and so thoroughly test it for screen and backlight leaks. When the test is over the car is leathered down by hand. This leaves a thin film of moisture which is dried off completely in four minutes. The infra-red radiation is controlled at a level which ensures that no part of the car exceeds a temperature of 180 deg F during its passage through the oven.

A conveyor stoving plant is designed to deal with one set of bus body components per hour



On emerging from the first oven the car passes into a spray booth in which spotting and touching up are carried out with cellulose paint. Then there is a travel of 20ft to afford a flash-off period and the car then passes through the cellulose drying



Another instance of special interest is where "machining" takes place after stoving without damage to the paint

oven, an operation which takes about three minutes.

The first infra-red plant consists of two ovens side by side. It is 17ft long, 24ft wide and 10ft high, and has a total loading of 300 kW. Each oven incorporates a total of 50 infra-red element projectors mounted in ten rows of five projectors per row, the heat output being controlled by Sunvic energy regulators.

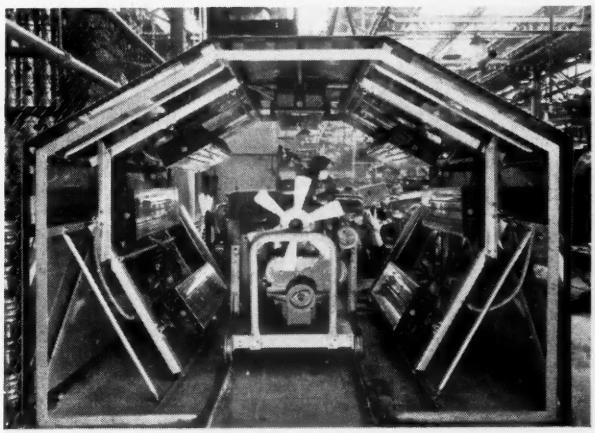
A separate air re-circulating system, consisting of a centrifugal fan driven by a 2·5 h.p. motor and displacing 4,000 cu ft/min, drives air into each oven through ducts mounted at floor level in the sides of the oven. Hot air is exhausted from the oven roof through three hoods extending the full length of the oven and linked by ducts to the suction side of the fan. The apertures in the lower ducts are louvred to direct the air stream on to the sides of the car and to avoid picking up floor dust. Dampers in each main duct allow a balance to be obtained between the re-circulated and the free air.

For complete operational safety, the conveyor motors and the fans are electrically interlocked with the projectors, while airflow switches, also interlocked with the projectors, ensure that the air velocity has reached a safe minimum value before the infra-red projectors can be switched on. Heat losses from the ovens are minimized by the use of heat insulating panels of mild steel lagged with glass wool and finished on the inside with asbestos hardboard. The panels may be easily removed to give access to the projectors and the wiring. Access to the central compartment is afforded by a hinged door fitted with a tumbler lock to prevent unauthorized entry.

The second plant is generally similar, except that it is 3ft shorter and has a total loading of 240 kW, using 40 infra-red projectors in each oven in ten rows of four.

Precautions are, of course, necessary where there is any possibility of inflammable solvents or products of the process becoming ignited by the red-hot elements. In most cases it is merely a matter of providing adequate ventilation to prevent a dangerous accumulation of inflammable gases in the

An infra-red oven with several 3ft 4 kW projectors is used for drying chlorinated-rubber air-drying grey paint on 1,800 lb castings

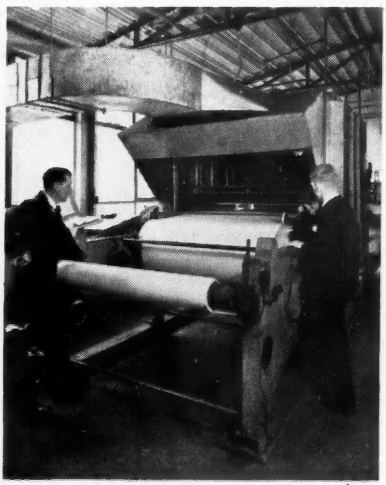


vicinity of the elements when they are at working temperature. In this instance the requirements of H.M. factory inspector were: The spray booth must be more than 20ft away from the infra-red oven; a forced air circulation must be provided to keep the solvent concentration low; airflow relays must be provided and interlocked with the oven supply, so that in the event of the ventilation system failing the oven is automatically cut off; the conveyor drive must be interlocked with the oven supply; and an exhaust hood must be provided to extend over the entire length of the plant.

In paint stoving by infra-red, the rate of temperature rise of the painted article, and the final temperature reached, will depend on such factors as the intensity of radiation on the painted surface, the time of exposure, the mass of the article, the waveband of the radiation employed and the absorption characteristics of the paint and of the underlying surface. The effect of colour on the temperature rise is also most marked. Black paints tend to absorb more of the radiation over a very wide waveband, whereas a glossy white paint is comparatively almost non-absorbent at the shorter wavelengths.

Plant at the works of the Metropolitan Cammell Co. for paint stoving 20-gauge aluminium panels used in the building of single- and double-deck omnibus bodies incorporates a single bank of element projectors mounted on a wheeled track facing a reflecting surface to form an open tunnel of adjustable width, thus enabling different sizes and shapes of panel to pass through on the conveyor. The panels are sprayed with undercoating on both sides and then stoved, after which a top coat is applied to one side only, which is also stoved. The panels are then ready for immediate assembly. The plant is fitted with ten 6ft 6in 6 kW infra-red element projectors and a control unit allows variation in the electrical loading and temperature of the projector bank to suit different stoving requirements.

High-intensity projectors with crimped-end elements are used to cure the p.v.c. coating on the fabric in the production of leathercloth



At the same works there is also an infra-red stoving plant, with a conveyor, for stoving reconditioned items for bus body overhaul. It is designed to do one set per hour, allowing for parts requiring more than one coat of paint. The oven has a total loading of 74 kW provided by twenty-four 3ft standard projectors, and measures 10ft 6in long by 6ft 6in wide by 8ft high. An incorporated air re-circulation system provides a power exhaust to atmosphere and assists in producing an even surface temperature on the varied products being stoved. Control is such that an infinite variation of heat output is provided from the second half of the oven.

An infra-red oven constructed by A.E.C., Ltd., incorporating several 3ft 4 kW projectors mounted on a simple framework, is used for drying chlorinated-rubber air-drying grey paint and grey synthetic paint on horizontal and vertical engine castings weighing about 1,800 lb each.

Another instance of special interest is where "machining" takes place after stoving without damage to the paint. The plant employed for this process incorporates a dip tank and a "travelling" oven. The initial problem was to devise a scheme for painting handwheels without applying paint to the machined portions and it appeared that dipping could not be used. By employing infra-red drying, however, it is now possible to dip and stove the wheels before machining them and the finish obtained in this way is durable and tenacious enough to withstand the handling received in later machining operations. The 36 kW normal electrical loading of the oven can be reduced by a series of energy

regulators to suit the products and production rate required. Electrical interlocks ensure that a stoppage of the conveyor automatically switches off the infra-red, while heat losses from the oven are reduced to a minimum by the use of heat-insulating panels of mild steel lagged with glass wool.

Infra-red radiation is also making an important contribution to increasing production in the ancillary trades to the motor industry. In the manufacture of leather-cloth, for example, it is necessary to heat a p.v.c. film on fabric without undue heating of the fabric itself and shallow penetration of infra-red is therefore desirable. The special absorption characteristics of this material are such that this is ensured when it is irradiated by a source at 750 deg C.

An installation for this type of work employs high intensity infra-red projectors with crimped-end elements to cure the p.v.c. coating on the fabric. The total loading of the projectors is 45 kW, or 2·5 kW per sq ft of the work surface area. Vinyl Products, Ltd., has incorporated standard high intensity units into a counter-balanced framework which can be readily raised from the surface of the fabric should it be necessary to stop production.

In the manufacture of laminated safety glass a "Vinal" inter-layer is placed between two glass sheets and preliminary adhesion is obtained by applying heat and pressure. The two panes of glass and "Vinal" inter-layer are assembled on a conveyor belt which passes through the assembly room, the two panes being located relative to each other by special templates which ensure that the edges are in exact alignment. The assembly is then passed through a series of rubber-covered pressure rollers which cause initial adhesion between the glass and the "Vinal," and during this process heat is applied by electric infra-red units.

Turbine Research

Institution of Mechanical Engineers' Conference

SEVEN papers from the Parsons and Marine Engineering Turbine Research and Development Association ("Pametrada") were presented on 6th March at a conference arranged by the Steam Group of the Institution of Mechanical Engineers.

In two of these papers Dr. T. W. F. Brown described the facilities available and discussed the main lines of research carried out at the test station, the design of which was governed by the decision to include a water brake capable of absorbing 60,000 s.h.p. at 160 to 300 r.p.m. The site of 35 acres, he stated, fronted a river with a flow that was ample for dissipating more than the 500 million B.Th.U./hr thus produced. The test bed, 83ft by 21ft 8in, was designed to withstand pulls or thrusts of 85 tons on any 2ft of the surface without distortion.

Several turbines of up to 4,000 s.h.p. had been installed. One of 1,200 s.h.p. operated with steam conditions of 1,100 lb/sq in and 1,150 deg F, and its exhaust at 200 lb/sq in and 850 deg was led to a steam brake which loaded the turbine. Steam for test rigs was supplied by a 40,000 lb/hr boiler at 1,200 lb/sq in and 1,050 deg F, which could be raised to 1,200 deg by a second-stage independently fired superheater. Boilers of upwards of 200,000 lb/hr had been brought in for test. A 3,500 h.p. gas turbine, designed by the Association, was now being run for research on the burning of heavy fuel oils. Provision was made for aerodynamic testing and for studying the effect of materials used for gearing. Electricity was obtained from the public mains at 5·5 kV. The staff employed numbered about 300.

Design developments, with especial reference to the usual marine range of 5,000 to 15,000 h.p. per shaft, with 7,000 h.p. giving the heaviest concentration in numbers, were dealt with by Mr. H. G. Yates, who expressed the view that steam turbines would not be generally replaced by gas turbines for marine propulsion for many years. Means adopted for securing an accuracy within ± 0·5 per cent in measuring specific steam consumption (except at the lower end of the power range) were described by Mr. M. H. Petty.

The testing of gears by the back-to-back method was the subject of a paper by Dr. A. Cameron and Mr. A. D. Newman which included particulars of the Pametrada torque loader, which enabled a known load

to be applied during running and the losses to be separated. A tentative analysis of ways in which casings of steam and gas turbines could be distorted when heated or cooled was made by Mr. B. J. Terrell, who cited practical examples in support of his views. Finally an account was given by Dr. O. P. T. Kantorowicz of an experimental exploration of turbine and gear vibrations.

Monopolies Commission

Board of Trade's Annual Report

IN its fourth annual report (for 1952) on the operation of the Monopolies and Restrictive Practices (Inquiry and Control) Act, 1948 (H.M. Stationery Office, 6d), the Board of Trade mentions that during the year reports of the Monopolies and Restrictive Practices Commission were published on the supply of insulated electric wires and cables and on the supply of insulin ; a further report on the match and matchmaking-machinery industries has been submitted to the Board. The first appendix to the report contains Parliamentary statements on the cable industry report.

One of two new references made to the Commission during the year related to the supply and exports of certain electrical and allied machinery and plant. Details of this reference are given in an appendix: it covers a wide range of turbines, generators, motors and transformers. The Commission is said to have made considerable progress with its inquiries in this direction and in other matters, including the supply and export of various semi-manufactures of copper and copper-based alloys.

The report also records the request to the Commission to make a general study of some practices based on its original reports. This concerns arrangements between traders for exclusive dealing and special terms.

As the result of discussions between the Ministry of Supply and the Electric Lamp Manufacturers' Association following the publication of the Commission's report on the electric lamp industry, the E.L.M.A. undertook to bring its arrangements into full conformity with the Government's conclusions from the report. A Parliamentary statement on this matter is printed as an appendix to the report.

Discussions with the Cable Makers' Association and the Covered Conductors' Association, initiated by the Ministry of Supply when the Commission's report on cables was published, are proceeding.

Part II of the report deals with suggestions and requests made to the Commission and it is emphasized that the inclusion of any suggestion or request implies no judgment that monopolistic conditions or restrictive arrangements do in fact prevail in the industry or trade concerned; still less that the effects of such conditions or arrangements are contrary to the public interest. Thus qualified, the list includes for the first time electric street lighting equipment. Electrical appliances and accessories and radio valves are also in the list, but these have been included in previous reports.

Trade with the Dominions

AT a Press gathering last week Mr. M. J. Gartside, chairman and international director of the Rheostatic Co., Ltd., spoke of impressions gained during a recent tour of Australia, New Zealand and South Africa. Mr. Gartside emphasized the value of visits by directors of British companies to these markets when it was often necessary to discuss and decide policy on the spot. He said that 1951 was a boom year followed by a natural reaction in 1952; he thought that this year there would be a gradual increase in trade on a more rational basis.

On the subject of manufacturing within the countries which had been British markets for many years, Mr. Gartside pointed out that if the choice was between this and the total loss of the markets the course was plain. He had the impression that Australia was tending to favour a return to its position as a primary producer. He did not think that the Australian Government's import restrictions were designed to protect manufacturers but they were forced upon it by the need to correct its balance of payments.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Hoover, Ltd.—The annual meeting will be held on 30th March. In his circulated review Sir Charles Colston (chairman) says that the past year was one of considerable difficulty both at home and abroad. The sellers' market has gone. High purchase tax, credit restrictions and the general disinflationary policy of the Government have considerably reduced the sales of the domestic appliance industry in Britain, while export markets have been severely affected by import restrictions, shortage of sterling, stronger competition, and the trade recession in so many countries which has followed on the heels of the boom caused by the outbreak of war in Korea. On the basis of the Board of Trade figures Hoovers have maintained their percentage of the total production of electric cleaners by all manufacturers in Britain, and have increased their percentage of the total production of electric washing machines. They have again exported more electric washing machines than all other British manufacturers combined and sales in the home market were substantially larger than in the previous year. They have now launched their new Mark II model which will be marketed side by side with the existing Mark I model. Their Cambuslang factory which produces f.h.p. motors is well equipped to meet competition, and they have taken steps to open up new export markets. The activity of their Service Department has been fully maintained. They have persevered in their efforts to expand exports to the United States and are hopeful that substantial progress will be made in the present year. Altogether they are exporting to eighty-nine countries. During the next few years they plan to introduce a number of new products.

Bruce Peebles & Co., Ltd., in the accounts now published for 1952 show a trading profit of £263,185, as compared with £293,081 for the previous year, and after providing £243,317 for depreciation and £170,000 for taxation, there is a net profit of £85,167 (against £108,325). As already announced, the ordinary dividend for the year is unchanged at 15 per cent and £15,425 is carried forward (against £16,939 brought in). The report states that the year's operations showed a greater turnover, but, owing to higher costs and keener competition, the trading profit is less than last year.

Ericsson Telephones, Ltd., report a trading profit for 1952, after providing for depreciation, etc., of £987,782, as compared with £1,009,101 for 1951. Taxation requires £534,636 and the net profit is £453,146 (against £431,199). General reserve receives £300,000 and it is proposed to pay a final ordinary dividend of 12 per cent, and a bonus of 5 per cent, both free of tax, making 22 per cent for the year. This is at the same rate as for the previous year, but the interim for 1951 was paid before a scrip issue. The balance carried forward is £238,978 (against £203,188 brought in from the previous year).

A. F. Bulgin & Co., Ltd., report a net profit for the year to 31st January of £27,382, as compared with £20,737 for the preceding year. Taxation absorbed £62,602. General reserve receives £10,000 and the dividend for the year is maintained at 30 per cent. The balance carried forward is £25,162 (against £23,530 brought in).

Brown Brothers, Ltd., report a group trading profit for 1952 of £718,265, as compared with £936,384 for the preceding year, and after providing £379,824 for taxation, the profit of the parent company is £205,353 (against £276,848). General reserves receive £105,000 and the ordinary dividend for the year is unchanged at 12½ per cent. The balance carried forward is £285,764 (against £280,076 brought in).

The Westinghouse Brake & Signal Co., Ltd.—The terms of the issue, to which Treasury consent has now been obtained, are announced. The issue is of 673,423 new £1 ordinary shares at 45s each on the basis of three for every five £1 stock units held. The Consolidated Signal Co., as the owner of 391,112 of the 1,122,372 Westinghouse units, is entitled to a provisional allotment of 234,667 of the new Westinghouse shares. It has been decided, however, that 225,822 of these shares will be provisionally allotted direct to Consolidated ordinary stockholders on the basis of three Westinghouse for every two £1 Consolidated units. The new shares will not rank for the final dividend which it is the intention to declare to-day (Friday).

E. K. Cole, Ltd., propose to capitalize £42,010 15s part of the amount standing to the credit of profit and loss account, and apply it in paying up in full 168,043 ordinary shares of

5s each to be allotted to ordinary stockholders in the proportion of one for six. The new shares will be converted on allotment into ordinary stock and will rank *pari passu* in all respects with the existing ordinary stock except that it will not entitle the holders to the interim dividend now declared. An extraordinary meeting to consider the proposal will be held on 30th March. An interim dividend of 10 per cent (unchanged) has been declared.

Thos. W. Ward, Ltd., have declared an interim dividend of 5 per cent (unchanged).

New Companies

Manors Electrical (North Eastern), Ltd.—Registered 21st February. Capital £2,000. Wholesalers, hirers, repairers of and dealers in electrical goods and equipment, radio, television and telephone apparatus, etc. Directors : G. R. Sutton and J. Taylor. Regd. office : 28, Mosley Street, Newcastle-on-Tyne.

Modern Acoustics, Ltd.—Registered 25th February. Capital £10,000. Manufacturers of all kinds of electrical, electronic, television, radio and acoustic components, equipment, accessories and apparatus, etc. Directors : M. T. Slater and E. L. Edwards. Regd. office : 2, Manor Way, Boreham Wood, Elstree, Herts.

Wainman Bros. (Electricians), Ltd.—Registered 25th February. Capital £2,000. Directors : J. K. Wainman, S. R. Wainman and J. Henaghan. Regd. office : 10, Roberts Road, Doncaster.

Miniature Lamps, Ltd.—Registered 12th February. Capital £500. Manufacturers and repairers of and dealers in electrical, gas and oil lamps, quartz lamps, lamp standards, etc. Directors : M. Black and S. Black. Regd. office : 4, Park Square, Leeds.

E. A. Sargood (1953), Ltd.—Registered 12th February. Capital £500. Electricians, mechanical engineers, etc. Directors : E. A. Sargood and C. K. Swabey. Solicitors : John T. Lewis & Woods, 52, Chancery Lane, W.C.2.

Electronic Gauges, Ltd.—Registered 18th February. Capital £100. Electronic designers and manufacturers, etc. Directors : J. B. Andrews, P. Buissom, J. E. Hill, I. Lawrence and M. Suire. Regd. office : Deason House, 23, Henry Street, Keighley.

D. Fisk & Co., Ltd.—Registered 28th February. Capital £2,500. Electricians, retailers, repairers, manufacturers, workers of and dealers in electrical apparatus and goods, etc. Directors : E. Ward and D. M. Fisk. Regd. office : 5, Guildhall Chambers, Basinghall Street, E.C.2.

Mackie Electrical Generators, Ltd.—Registered 28th February. Capital £100. Electrical engineers, manufacturers of and dealers in electrical generators, dynamos, magnetos, motors, etc. The first directors are to be appointed by the subscribers. Regd. office : 129, Lambeth Road, S.E.1.

G. W. Henry, Ltd.—Registered 27th February. Capital £1,000. To acquire the business of electrical engineer and contractor carried on by G. W. Henry at Crosland Moor, Huddersfield. Directors : G. W. Henry and Mrs. Dorothy K. Henry. Regd. office : 59, Park Road, Crosland Moor, Huddersfield.

Foster & Smith (London), Ltd.—Registered 27th February. Capital £100. Diesel, electrical and mechanical engineers, dealers in diesel, electrical and mechanical spares, etc. Directors : F. J. D. Smith and G. Sargent. Regd. office : 349, Harrow Road, W.9.

Increases of Capital

Lincoln Electric Co., Ltd.—Increased by £288,000, in £1 ordinary shares, beyond the registered capital of £12,000. At 14th February Lincoln Electric Holdings, Ltd., held a majority of the issued shares.

Lincoln Electric Holdings, Ltd.—Increased by £288,900, in 100,000 preferred ordinary and 188,900 ordinary shares of £1 each, beyond the registered capital of £11,100.

Meeting of Creditors

Johnson & Tanner, Ltd.—A meeting of creditors will be held on 18th March at the Criterion Hotel, Piccadilly, London, W.1.

Liquidations

Innocent (Refrigeration), Ltd., refrigeration and electrical engineers.—Winding up voluntarily. Liquidator, Mr. G. C. Ehlers, 23, Baldwin Street, Bristol, appointed 16th February.

Premier Electric Services, Ltd.—In voluntary liquidation. Pursuant to Section 299 of the Companies Act, 1948, meetings of members and creditors will be held on 12th March at the offices of A. C. Palmer & Co., Court Chambers, Friar Lane, Leicester.

Bankruptcies

T. R. Hugo, 45, Stanley Street, Southsea, carrying on business under the style of Victor Hugo's at 51, Fawcett Road, Southsea, radio and electrical engineer.—First meeting held 10th March. Public examination 13th April at the County Court, Ashburton Road, Kent Road, Portsmouth.

A. S. Bennett, lately carrying on business at South View, Webb's Avenue, Stannington, Yorks, electrical contractor, now employed as an electrical engineer.—Receiving order made 4th March on debtor's own petition.

S. A. Cooper, 17, St. Margaret's Road, St. Marychurch, Torquay, electrical engineer.—Application for discharge to be heard on 14th April at the New Town Hall, Torquay.

ENFIELD CABLES INVESTIGATION

AT the annual meeting last June of Enfield Cables, Ltd., a stockholders' committee was formed to receive a report which the board had instructed Messrs. Peat, Marwick, Mitchell & Co., accountants, to prepare. The inquiry was set afoot after it was found that the group's profits had fallen by about £325,000 in 1951 although the directors at the time of a share issue in December, 1951, had forecast the maintenance of the gross profit percentage of 1950.

The accountants' report says that actually the 1951 gross profit was 3·3 per cent less than in 1950 and the net profit was some £250,000 down because of an increase in overhead charges of about that amount.

It is stated that investigations were hampered by the absence of a comprehensive costing system and running stock records and it is possible only to indicate broadly what are believed to be the principal causes of the position. It had been the policy of the management in 1951 to concentrate on what were thought to be profitable lines in order at least to maintain the rate of gross profit. There were, however, other factors which tended to offset the effect of this policy, such as a decline in sales of one of the most profitable lines and increased sales of a line being made at a loss; a loss on the fall of rubber prices and less profit than in 1950 on fluctuations in the price of copper; and an unsatisfactory year's trading by the contract department. These, with other factors, caused a decline of £137,000.

The rise in overhead charges is attributed to increased selling, distribution and administrative expenses, increased interest and discount charges and increased contributions to trade association pools.

Dealing with Brynmawr Rubber, Ltd., the report shows that this company's trading loss in 1950 was £54,000; in 1951 the loss rose to £129,000; and the loss for 1952 is expected to be of the order of £275,000. The accountants criticize the project on a number of grounds and say some time must elapse before losses can be stopped and profits made commensurate with the capital invested in the business.

In their recommendations the accountants say that the Enfield cable business is intrinsically sound but its prospects will largely be conditioned by factors outside the company's control. Although the group appears to have adequate financial resources, it is not possible at present to ascertain what further requirements may arise from Brynmawr or Australia, apart from capital expenditure at Enfield. It would be prudent to reduce short-term borrowings and avoid further schemes involving additional financial commitments for the time being. The administrative staff has proved inadequate to deal with the rapidly-growing business, in part due to the failure of the older officials to train up the younger men. Headway has been made in reorganizing the Brynmawr business, but many difficulties lie ahead and the board should be strengthened.

In commenting upon the directorate and management the report says that for many years the Earl of Verulam has been managing director of the company and chairman for the past three years. His knowledge of the affairs of the business is unsurpassed by anyone in the organization. As an executive director he has taken too much on his own shoulders and as chairman has failed to draw from his colleagues the help and advice with which they might have furnished him, but he has worked very hard in the company's interest, as he saw it. Although the Brynmawr venture has involved the company in heavy losses the Brimsdown cable works are operating at a high level of productivity and profitability. Although some reorganization is essential it is important that Lord Verulam's experience, advice and assistance should be preserved.

Steps to improve the accounting system are recommended.

Referring to the directors' forecast of profits in 1951, the accountants say they have no doubt that each director believed that the forecast he was making was correct at the time he made it. But although the estimate was made when most of the financial year had passed, no figures of estimated profit were laid before the board, or called for by the board. If a statement of overhead expenses had been prepared and allowance made for the increased Brynmawr loss, it would have been seen that the 1950 level of profit could not be achieved without a rise in the gross profit percentage.

A statement submitted on behalf of the directors is appended to the report and in the introductory section it is stated that Lord Verulam has suggested that the offices of chairman and managing director should be separated and that he should relinquish the chairmanship. The accountants agree in the belief that by concentrating his energies on the duties of managing director he will be employing his knowledge and experience to the company's best advantage. Sir Philip Warter has intimated that he will accept the chairmanship of the company and the board is to be strengthened by the appointment as a director of Sir Edwin Herbert.

It is considered desirable that the managing director should be adequately assisted by an assistant managing director or a general manager with a seat on the board and it is also thought that a technical director should be appointed as and when opportunity offers.

STOCKS and SHARES

THE Russian news has had hardly any effect in the Stock Exchange. With the industrial markets inclined to take a breather after the rapid ascent of prices during the past month or two, the gilt-edged market showed an inclination to take up the running last week. This market had been comparatively static since the start of the year, and its failure to join in the cheerful performance of industrials was beginning to act as a drag on the latter's continuance. A revival in British Government stocks contributed consequently to the maintenance of a generally firm front in the industrial section. British Electricity stocks are half a point up on the week.

Company News

Palestine Electric £1 shares have recovered from 8s to 13s 6d over the past week or two on the company's statement that agreement has been reached with the Israel Government in respect of electricity tariffs. Under new rates the company is now in a position to pay its way and to resume dividends to ordinary shareholders, who have received nothing since the 5 per cent tax-free distribution for 1950. A. F. Bulgin & Co. are again paying an ordinary dividend of 30 per cent, but from increased net earnings, which cover the distribution approximately twice over. The 1s shares are quoted officially at 2s 7½d, but have changed hands since this news at over 3s.

Price Changes

Ericsson Telephones 5s shares rose 1s to 43s 9d, on the announcement of a final dividend, making a total of 22 per cent tax free for the year. A few sellers came in and the price reacted to 42s 6d. The amount involved in payment of preference and ordinary dividends is about £4,000 higher this time at £117,000, which is barely a quarter of the distributable profit after tax. This comes out £20,000 above the 1951 figure. Associated Electricals at 78s 9d, ex dividend, have recovered the dividend deduction. English Electrics have done the same, and advanced further. Deccas have again been conspicuously well supported, and others showing good improvements include Chloride, Brook Motors, E. K. Cole and E.M.I.

Westinghouse Brake Issue

Shareholders in the Westinghouse Brake & Signal Company are due to receive this week-end their provisional allotment letters in connection with the offer of ordinary shares, in the proportion of three new for every five shares held, at a price of 45s. With the existing shares very firm at about 61s 3d (having risen by more than 10s since the beginning of the year) in advance of the issue, the prospective value of the "rights" was about 6s 3d a share. The company has expressed the belief that it will be possible to maintain the dividend, on the capital so increased, at the rate of 15 per cent paid for the past year. This represented an increase of 1 per cent on the previous distribution, and was shown by the full accounts to be covered by earnings equivalent to 67 per cent on the present capital.

London Electric Wire

The current tendency for investment to favour shares in the companies which have lately been conspicuously conservative in their dividend policies is evident in the case of London Electric Wire & Smiths £1 ordinary shares. From 51s 3d at the beginning of the year, the quotation has been raised by steady stages to 59s 6d. A year ago, the company reported an increase of 50 per cent in the trading profits, out of which was added a 2½ per cent bonus to the 10 per cent rate of dividend paid for some years previously. The total of 12½ per cent required the disbursement of only £66,000 net out of an available surplus of over £500,000. Since then, the interim dividend for 1952 has been raised from 4 to 5 per cent, with a warning that this should not be taken to imply a larger total for the year. A yield of less than 4¼ per cent on the shares at their present price suggests that hopes are, nevertheless, entertained in that connection. The final dividend was declared last time early in May.

Tax Burdens

Some recent market movements suggest that, despite the absence of any positive encouragement from the revenue figures to date, the City is not entirely without hope of a reduction in the present scales of company taxation. In the accounts and results now beginning to appear in respect of 1952, there is fresh evidence every day of the severity with which tax liabilities are handicapping the ability of the enterprising firm to save enough from its earnings to finance the mere maintenance and replacement of its present assets, let alone their expansion and development. Hopes are centred on the possibility that next month will see the back of the excess profits levy.

The electrical equipment market has already seen this year a good deal of the excess profits levy in action. It was shown to have cost English Electric over half a million, which is more than the amount distributed for the ordinary dividend. A.E.I. has to provide more than a million for the levy in total tax liabilities of £7·2 million, so that, of a rise of nearly £1 million in the group's trading profit, less than £200,000 net remains for reserves and dividends. In the case of International Combustion, a 5% per cent increase in taxation seems to have swamped the progress of earnings.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 9th Mar. 1953	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	85½	+½	3	10	2
Brit. Elec. 1974/77	3	3	84½	+½	3	11	0
Brit. Elec. 1976/79	3½	3½	91½	+½	3	16	6
Brit. Elec. 1974/79	4½	4½	100	+½	4	5	0
Calcutta Elec. ..	6†	6†	20/-	—	6	0	0†
East African Power	7	7	23/6	+6d	5	19	3
Nigerian Elec. ..	10	10	23/-	+ 1/6	8	14	0
Palestine Elec. "A"	5†	Nil	13/6	+1/-		—	
Perak Hydro-Elec.	Nil	Nil	15/-	+6d		Nil	
Equipment and Manufacturing							
AberdareCables(5/-)	20	25	16/6xd	—	7	11	6
Aerialite (1/-) ..	83½	88½	9/6	—	9	6	0
Allen, W. H. ..	15	15	43/9	—		—	
Aron Elec. Ord. ..	15	15	38/9	—	7	14	10
Assoc. Elec. Ord..	20	20	78/9xd	+ 1/6	5	1	6
Automatic Tel. & El.	15	15	62/6	+6d	4	16	0
Babcock & Wilcox	18	18	72/-	+1/-	5	0	0
Baldwin, H. J.(2/-)	25	20	4/-	—	10	0	0
Bakelite (10/-) ..	—	12½	18/3	+3d	6	17	0
British Aluminium	10	12	42/6	+6d	5	13	0
B.I. Callender's ..	7½	9	35/3	+6d	5	2	2
British Thermostat (5/-)	30	30	33/3	—	4	10	3
British Vac. Cleaner (5/-)	25	25	15/6	−6d	8	1	3
Brook Motors (10/-)	20	20	35/-	+½	5	14	3
Brush Ord. (5/-) ..	10	10	5/-	—	10	0	0
A. F. Bulgin (1/-)..	30	30	2/7½	—	11	8	6
Burco (5/-) ..	38§	35	19/6	—	8	19	6
Chloride El. Storage	15	15	70/6	+1/9	4	5	0
Cole, E. K. (5/-) ..	25	25*	20/6	+2/-	6	2	0
Cossor, A. C. (5/-)..	Nil	10	11/-	—	4	11	0
Crabtree (10/-) ..	17½	17½	31/9xd	—	5	10	3
Crompton Parkinson Ord. (5/-) ..	11¼	11¼	9/6	—	5	18	5
De La Rue (5/-) ..	50	35*	8/9	+3d		—	
Decca (1/-) ..	112½	150	25/6xd	+½	5	17	8
Dewhurst (2/-) ..	22½	19*	5/3	—	7	4	9
Dictograph Tel. (2/-)	20	20	6/-	+3d	6	13	4
E.M.I. (10/-) ..	12	12	14/6	+9d	8	5	6
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	55/-	—	5	9	1
Enfield Cable Ord.	7½	7½	21/6	−2/6	6	19	6
English Electric ..	15	15	58/9xd	+2/3	5	2	3
Ericsson Tel. (5/-)	22†	22*†	42/6	−3d	2	11	9†
Ever Ready (5/-)..	35	35	27/6	—	6	7	3
Falk Stadelmann..	15	15	42/9	—	7	0	3
G.E.C. Ord. ..	22½	22½	43/6xd	+3d	5	3	6*
General Cables (5/-)	30	30	16/3	—	9	4	6
Greenwood & Batley	15	15	38/3	—	7	16	10
Hackbridge Cable (5/-)	20	20	11/9	—	8	10	3
Hackbridge Hewittic (5/-)	18	20	16/3	—	6	3	0
Hall Tel. Acc. (10/-)	10	10	9/6	—	10	10	6
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (10/-) ..	20	20	18/6	—	5	8	1*
Holophane (5/-) ..	15	20*	12/-	—	8	6	8
Hoover (5/-) ..	25	25	22/3xd	+9d	5	12	4
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	25	15*	13/3xd	+3d	5	13	3
Johnson & Phillips	15	15	58/3	+9d	5	3	0
Lancashire Dynamo	22½	12½*	45/9	—	5	9	3
Laurence, Scott (5/-)	12½	15	13/9	—	5	9	1
London Elec. Wire	12½	12½	59/6	+2/-	4	4	0
J. Lucas	7½	9⅜	40/-	—	4	11	8
Marryat & S. (2/-)	22½	22½	5/-	—	9	0	0
Mather & Platt ..	12½	15	49/-xd	+1/-	6	2	6
Metal Industries ..	10	15	45/9xd	+6d		—	
Mid. Elec. Mfg. ..	15	15	59/6	—	5	0	9
Murex	12½	15	60/-	+1/6	5	0	0
Newman Ind. (2/-)	6	10	2/9	+6d	7	5	6
Oldham & Son (1/-)	30	35	2/9	+3d		—	
Parnall (Yate) (5/-)	6	6	3/4½	—	8	17	10
Parsons, C. A. ..	15	10*	70/-	—		—	
Plessey (5/-) ..	22½	25	23/3	+9d	5	7	6
Pye Deferred (5/-)	18	18	17/3	—	5	4	4
Revo (10/-) ..	27½	27½	46/-	—	5	19	7
Reyrolle	15	10*	57/6	—		—	
Scot. Cable (4/-) ..	30	32	12/6	+3d		—	
Siemens Ord. ..	10	10	36/6	+6d	5	9	6
Southern Areas ..	Nil	5	12/9	—	7	16	9
Strand Elec. (5/-)..	17½	17½	9/3	+6d	9	9	2
Sturtevant (5/-) ..	16½†	17¼*†	24/6	—		—	
Switchgear&Cowans (5/-)	22½	22½	16/-	—	7	0	8
Taylor T. (5/-) ..	20	25	20/6xd	+6d	6	2	0
T.C.C. (10/-) ..	20	20*	38/-	—		—	
T.C. & M. ..	10	10	28/-	—		—	
Telephone Mfg. (5/-)	10	10	9/3	—	5	8	0
Thorn. Elec. (5/-)..	10	12½	9/6	—	6	11	6
Tube Investments	25	15*	62/6	—	4	16	0
Vactric (5/-) ..	Nil	Nil	4/6	—		Nil	
Veritys (5/-) ..	Nil	7½	5/-	—	7	10	0
Walsall Conduits (4/-)	70	70	46/6	—		—	
Ward & Goldstone (5/-)	45	45*	32/6	—		—	
Watford (2/-) ..	25	25	7/-	+3d	7	2	10
Westinghouse Brake	14	15	61/3xd	+9d		—	
West, Allen (5/-) ..	12½	15	12/-	+3d	6	5	0
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	—	6	83	+5	7	4	6
Ord.	—	3¾	54½	+2	6	17	6
Anglo-Portuguese	8	8	21/6	—	7	8	10
Brit. Elec. Traction: Def. Ord. ..	22½	25	500	—	5	0	0
Cable & Wireless: Ord.	6	8	125½	—	6	7	6
4% Loan ..	4	4	94½	—	4	4	9
Calcutta Trams ..	6†	6†	22/3	—	5	7	9†
Cape Elec. Trams..	5	5½	11/-	—	10	0	6
Marconi Marine ..	10	10	31/-xd	—	6	9	0
Oriental Tel. Ord.	16	16	60/-	—		—	
Telephone Props...	8	8	41/3	+7.6	3	17	6
Tele. Rentals (5/-)	10	10	9/3	—	5	8	1

* After capital bonus.
† Dividends are paid free of Income Tax.

NEXT WEEK'S EVENTS

Monday, 16th March

BIRMINGHAM.—James Watt Institute, 6.45 p.m. I.E.E. South Midland Students' Section. "Science in the Coal Industry," by H. R. Gregory. (Joint meeting with Students and Graduates of Institutions of Civil and Mechanical Engineers.)

Midlands Hotel, 6.15 p.m. Birmingham Electric Club. Annual general meeting. "Electricity in a Steel Works," by R. Paterson.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Radio Telemetering," by E. D. Whitehead and J. Walsh.

LONDON.—St. Ermin's Hotel, Caxton Street, 7.10 p.m. A.S.E.E. Central London Branch. "Automatic Electric Equipment," by W. Cooke.

NEWCASTLE-UPON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Annual general meeting.

NORWICH.—Royal Hotel, 7.30 p.m. I.E.E. District Meeting. "The Determination of Time and Frequency," by H. M. Smith.

PRESTON.—Starkie House, Starkie Street, 7.30 p.m. Institution of Works Managers, Preston Branch. "Some Legal Aspects of Management," by L. Walsh.

READING.—3–5, Market Place, 7 p.m. I.E.E. District Meeting. "Some Recent Developments in Electricity Supply," by H. Nimmo.

Monday, 16th March, to Wednesday, 18th March

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. Symposium on Insulating Materials.

Tuesday, 17th March

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio Group. "Electronic Equipment in Aircraft."

CROYDON.—Greyhound Hotel, 7.15 p.m. Purchasing Officers' Association, Croydon Group. "Foreign Manufacturing Conditions as seen through British Eyes."

DUMFRIES.—Ewart Library, 7.30 p.m. Dumfries and Galloway Electrical Society. "The Practical Development of Wind Power," by J. Venters.

GLASGOW.—39, Elmbank Crescent, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Some Researches on Circuit-Breaking by means of High-Voltage Circuit-Breakers, with special reference to Current-Chopping," by A. F. B. Young.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Students' Section. Three short papers to be read by members of the Students' Section. Joint meeting with the Centre Utilization Group.

LIVERPOOL.—Radiant House, Bold Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, Liverpool and District Branch. "Centrifugal Pumps," by N. Youatt and G. O. Stevenson.

LONDON.—2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "The Applications of Electricity to Oil Refineries," by S. York.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre Utilization Group. "The Technique and Development of Automatic Winding in Mine Shafts," by B. L. Metcalf and G. Cuttle.

ST. ALBANS.—Peahen Hotel, 7.30 p.m. Incorporated Plant Engineers, Hertfordshire Discussion Group. "Rubber in Industry," by R. E. Reynolds.

STAFFORD.—Purchasing Officers' Association, Wolverhampton Branch. Evening visit to the works of the English Electric Co., Ltd.

WEALDSTONE.—Railway Hotel, 7.15 p.m. Purchasing Officers' Association, Watford and Harrow Group. "Standardization, Simplification and Specification," by F. Kay.

Wednesday, 18th March

BIRMINGHAM.—Imperial Hotel, 6.30 p.m. Institution of Heating and Ventilating Engineers, Birmingham and District Branch. Induction of new chairman. "Medium Pressure Hot Water Heating," by J. N. Saunders.

BRISTOL.—Electricity House, 7 p.m. I.E.E. Bristol Students' Section. Annual joint Brains Trust with the Graduates' Section of the Institution of Mechanical Engineers.

Grand Hotel, 7.15 p.m. Incorporated Plant Engineers, Western Branch. Annual general meeting. "Some Aspects of Metallurgy in Plant Engineering," by J. Hinde.

COVENTRY.—Technical College, 7.15 p.m. A.S.E.E. Coventry Branch. "Planned Maintenance Relative to Electrical Breakdowns," by H. Westwood.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Modern Trends in Aerial Design," by J. Patterson.

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. "Electronic Telephone Exchanges," by T. H. Flowers.

GLASGOW.—39, Elmbank Crescent. Institute of Welding, West of Scotland Branch. "Recent Developments in Arc Welding Electrodes," by D. M. Young.

Building Centre, 7.30 p.m. Purchasing Officers' Association, Glasgow Branch. "The Manufacture of Glass."

LONDON.—Connaught Rooms, Great Queen Street, W.C.2. Batti-Wallah's Society. Annual ladies' night.

At the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, 5.30 p.m. Institution of Locomotive Engineers. Annual general meeting. "Locomotive Maintenance," by R. C. Bond.

John Adam Street, Adelphi, 2.30 p.m. Royal Society of Arts. "Fifty years' Work on Industrial Standards," by H. A. R. Binney.

MANCHESTER.—Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Circuit Breakers," by T. Atherton.

Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "Television Receiver Design," by Dr. A. J. Biggs.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. "Lighting for Schools," by J. W. Howell.

NEWCASTLE-UPON-TYNE.—8, Oxford Street, 7.30 p.m. Institution of Engineering Inspection, North-East Coast Branch. "Radiography," by Mr. Gottfeld.

PRESTON.—19a, Fishergate, 7.15 p.m. I.E.S. North Lancashire Group. "Lighting and Vision as Age Advances," by H. C. Weston.

ROCHESTER.—Bull Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Fluid Flow," by R. F. Walters.

WEYMOUTH.—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "An Investigation into the Mechanism of Magnetic Tape Recording," by Dr. P. E. Axon.

WIMBLEDON.—32, Worple Road, 8.15 p.m. South-West London Branch, Association of Supervising Electrical Engineers. "Electrical Maintenance—Location of Faults," by P. H. Usher.

Thursday, 19th March

BRISTOL.—Exeter Electric Club. Visit to the General Accessories Co.'s Works, Bristol.

CARDIFF.—Institute Buildings, Park Place, 6 p.m. The South Wales Institute of Engineers. "Factors Influencing the Design of Coal Preparation Plants," by W. H. Griffiths.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "110 kV Transmission Line Erection in Ireland," by M. A. Healy and F. Neary.

(*Continued at foot of page* 607)

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 22nd April, from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1948

4636. O'Dell, A. E. (Punch Engineering Pty., Ltd.).—Telephone signalling systems. 20th February, 1948. (690547.)

8650. Brush Development Co.—Magnetic recording and reproducing. 24th March, 1948. (690376.)

15572. British Thomson-Houston Co., Ltd.—Electric valve control circuits. 9th June, 1948. (690377.)

28824. Murphy Radio, Ltd., and McMullin, T. A.—Precise electrical measurements of short time intervals. 7th November, 1949. (690477.)

29456. Ward, Blenkinsop & Co., Ltd., Hopf, P. P., and Lishmund, R. E. J.—Electrical resistors. 14th November, 1949. (690478.)

32453. British Thomson-Houston Co., Ltd., Taylor, H. B., and Watts, A. J.—Rotating joints for wave guides. 18th November, 1949. (690380.)

1949

718. Murphy Radio, Ltd., and McMullin, T. A.—Radar and like apparatus. 7th November, 1949. (690480.)

1189. Electric & Musical Industries, Ltd.—Apparatus for scanning kinematograph film for the purpose of generating or recording television signals. 5th January, 1950. (690482.)

3042. Hivac, Ltd., Goulding, F. A., and Brewster, H. G.—Thermionic valves. 3rd February, 1949. (690420.)

9420. Turnbull, F.—Protectors for heating elements of fires employing radiating heating elements. 6th July, 1950. Addition to 633110. (690484.)

19601. English Electric Co., Ltd.—Automatic curve-following apparatus. 20th October, 1950. (690426.)

28993. Ward, Blenkinsop & Co., Ltd., Hopf, P. P., and Lishmund, R. E. J.—Production of electrical conducting layers upon insulating surfaces. 14th November, 1949. Cognate application 17664. 4th July, 1949. Divided out of 690478. (690486.)

32325. Electric & Musical Industries, Ltd.—Apparatus for controlling the time relationship between different occurrences especially as applied to apparatus for scanning kinematograph film for the purpose of generating or recording television signals. 5th January, 1950. Cognate application 24719. 27th September, 1949. Divided out of 690482. (690487.)

1950

1951. Electro-Chemical Engineering Co., Ltd., Smart, A., and Herbert, A. T.—Apparatus for carrying out electrolytic or acid immersion processes. 3rd January, 1951. (690619.)

2999. Fox, J. W., and Lewis, E. M.—Ultrasonic equipment. 7th May, 1951. (690489.)

5919. N. G. N. Electrical, Ltd.—Fluorescent electric lighting tubes. 8th March, 1951. (690431.)

11134. English Electric Co., Ltd.—Cubicles and the like for electrical apparatus. 4th May, 1951. (690388.)

13035. Evans Electroselenium, Ltd., and Collins, G. C.—Apparatus for measuring reflectivity. 24th May, 1951. (690561.)

13494. Parsons & Co., Ltd., C. A., and Sinfield, D. G.—Methods of fusion welding. 30th May, 1951. (690562.)

15003. Vuille, B. A.—Indicating devices for remotely controlled electrical apparatus. 14th June, 1951. (690495.)

16036. British Thomson-Houston Co., Ltd., and Hewitt, W.—Electric motors. 18th April, 1951. (690496.)

16367. Green & Son, Ltd., E.—Electrostatic dust extractors. 7th June, 1951. (690628.)

16431. Siemens Bros. & Co., Ltd., and Double, H. S.—Magnetic amplifiers and automatic voltage regulating arrangements employing such amplifiers. 29th June, 1951. (690436.)

18360. Holophane, Ltd., and English, S.—Lanterns for street lighting purposes. 28th June, 1951. (690502.)

18697. Parsons & Co., Ltd., C. A.—Shaft seals. 17th June, 1951. (690569.)

19004. Harries, J. H. O.—Thermionic valves and circuits. July 9, 1951. (690438.)

19094. British Telecommunications Research Ltd.—Electrical timing circuits employing thermionic valves. 3rd July, 1951. (690503.)

20899. Marconi's Wireless Telegraph Co., Ltd.—Class B modulation-frequency transformer circuit arrangements. 8th June, 1951. (690504.)

23480. Marconi's Wireless Telegraph Co., Ltd.—Radar display arrangements. 22nd June, 1951. 690577.)

25029. General Electric Co., Ltd., and Watkins, T. B.—Electromagnetic apparatus of the kind which includes a thermionic valve control circuit. 10th October, 1951. (690441.)

25030. General Electric Co., Ltd., Murray, G., and Watkins, T. B.—Automatic frequency control of electrical oscillation generators. 10th October, 1951. (690442.)

25348. Bond, R.—Appliance for making calculations relating to the power factor in an electrical installation. 18th October, 1951. (690444.)

NEXT WEEK'S EVENTS

Thursday, 19th March *(continued)*

GLOUCESTER.—2, St. Aldate Street, 6.15 p.m. I.E.S. Gloucester and Cheltenham Centre. Film show and annual general meeting.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Utilization Section. Discussion on "Economics in Wiring Practice," opened by Forbes Jackson, P. McKearney and A. V. Milton.

Dorchester Hotel, Park Lane, W.1, 6.30 for 7 p.m. Electrical Wholesalers' Federation. Annual dinner.

Caxton Hall, Westminster, 2.30 p.m. Diesel Engine Users' Association. "Diesel Usage in the Army," by Major General C. Bullard.

LOUGHBOROUGH.—Technical College, 6.30 p.m. Institution of Heating and Ventilating Engineers, East Midland Branch. "The Heat Pump," by P. E. Montagnon. (Joint meeting with the East Midlands Section of the Institute of Fuel.)

MAIDSTONE.—Royal Star Hotel, 8 p.m. A.S.E.E. Kent Branch. "Induction Motors," by C. Severs.

Friday, 20th March

HARROGATE.—Grand Hotel, 7 p.m. I.E.E. North Midland Centre. Dinner-dance.

LONDON.—Connaught Rooms, 12.45 for 1.15 p.m. British Refrigeration Association. Annual luncheon.

Connaught Rooms, W.C.2. Institute of Transport. Annual dinner.

Townsend House, Greycoat Place, S.W.1, 7 p.m. Junior Institution of Engineers. "The Æther—an Engineering Conception," by J. Heywood.

SOUTHAMPTON.—University College, 7 p.m. E.P.E.A. Southern Technical Group. "Combustion," a film and paper on boiler plant, by G. H. Harford.

STONE.—Crown Hotel, 7 p.m. for 7.30 p.m. I.E.E. North Staffordshire Sub-Centre. Annual dinner.

[illegible]YTHING.—Talbot Hotel, 7.15 p.m. Worcester Electric Club. Annual general meeting.

25651. General Electric Co., Ltd., and Williams, C. E.—Electric lighting arrangements comprising electric lamps. 3rd September, 1951. (690507.)

26491. Ward & Goldstone, Ltd., and Goldstone, S.—Identifying coverings for electric wires or cables. 25th October, 1951. (690508.)

29334. Radiation, Ltd.—Gas or electric cookers. 1st November, 1951. (690644.)

31191. General Electric Co., Ltd., Bowtell, J. N., and Peach, D. C.—Electric circuit arrangements comprising electric discharge lamps. 19th October, 1951. (690514.)

31228. Electrolux, Ltd.—Suction nozzles for vacuum cleaners and brushes applicable thereto. 22nd December, 1950. (690645.)

1951

2611. Gerlat, M. E.—Electrical fused plugs and adaptors. 2nd February, 1951. (690517.)

5782. Etablissements E. Jaeger.—Synchronous motor clockwork. 9th March, 1951. (690653.)

6367. Standard Telephones & Cables, Ltd.—Electric signal amplified systems. 16th March, 1951. (690590.)

7240. Compagnie Générale de Télégraphie Sans Fil.—Glass to metal seals. 28th March, 1951. (690519.)

7443. Ebonestos Industries, Ltd.—Electrical storage batteries. 28th January, 1952. (690408.)

7932. Philips Electrical Industries, Ltd.—X-ray apparatus for deep therapy. 5th April, 1951. (690656.)

7949. United-Carr Fastener Corporation.—Sockets for electric lamps, electrical plugs or the like. 5th April, 1951. (690520.)

8825. Philips Electrical Industries, Ltd.—Circuit arrangements for use in automatic signalling systems for adjusting a group selector. 16th April, 1951. (690453.)

10311. British Optical & Precision Engineers, Ltd.—Electroscopes. 31st January, 1952. (690409.)

10480. Ranco, Inc.—Electric snap switch. 4th May, 1951. (690659.)

11073. Marconi's Wireless Telegraph Co., Ltd.—Keying control circuits for radio transmitters. 31st January, 1952. (690410.)

13148. Puttmann, K.—Electrical apparatus for the ighting of fires. 2nd June, 1951. (690667.)

13820. Mechanical Products, Inc.—Automatic electric circuit breakers. 11th June, 1951. (690530.)

15301. Shardlow Electric Wires, Ltd., and Jones, P.—Electric cable coupling devices. 27th June, 1951. (690532.)

17027. Kaick, A. Van (trading as Kaick Avk Generatoren- und Motorenwerk, A. Van).—Alternating current generators. 18th July, 1951. (690456.)

22149. Westinghouse Electric International Co.—Control systems for operating a direct current electric motor from an alternating-current line. 21st September, 1951. (690604.)

22174. Metropolitan-Vickers Electrical Co., Ltd.—Electrical cables. 21st September, 1951. (690535.)

23388. British Thomson-Houston Co., Ltd.—Methods of cutting laminated metal. 8th October, 1951. (690605.)

24063. Allmanna Svenska Elektriska Aktiebolag.—Cutting device for continuously advancing articles such as tubes. 16th October, 1951. (690606.)

24817. Shepherd, G. R. (Westinghouse Electric International Co.).—Dynamo-electric machines. 24th October, 1951. (690538.)

24818. Shepherd, G. R. (Westinghouse Electric International Co.).—Cooling and insulation of electrical apparatus. 24th October, 1951. (690537.)

25456. Brush Development Co.—Device for controlling light intensity. 31st October, 1951. (690467.)

29171. Mallory Metallurgical Products, Ltd.—Electrical contacts and contact materials and a method of manufacture thereof. 13th December, 1951. (690540.)

1952

352. Brush Development Co. and Morle, C. W.—Drive arrangements for magnet record transducing apparatus. 24th March, 1948. Divided out of 690376. (690415.)

923. British Thomson-Houston Co., Ltd.—Steam irons. 11th January, 1952. (690542.)

1253. Pittsburgh Consolidation Coal Co.—Method of converting carbon to electrical energy. 16th January, 1952. (690544.)

2399. Philips Electrical Industries, Ltd.—Electric-discharge tubes. 29th January, 1952. (690472.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 4th April.

HILOTROL. No. 712,806, Class 9. Electrical apparatus included in Class 9 for controlling the operation of electric motors.—De Renzi, Holmes & Co., Ltd., Fox's Lane, Wolverhampton.

No. 712,843 (design), Class 9. Electrical measuring instruments and apparatus.—H. C. Atkins Laboratories, Ltd., Munster Park Works, Gowan Avenue, Fulham, London, S.W.6.

TELE-MAGNI. No. B713,083, Class 9. Television magnifying lenses.—H. Ramsden, trading as Plastic Products (Golcar), Taylor Street, Golcar, near Huddersfield.

TRIX. No. 713,738, Class 9. Sound recording and reproducing apparatus and instruments; radio, telephonic, telegraphic and television apparatus and instruments; photographic and cinematographic apparatus and instruments; signalling apparatus and instruments; talking machines; and parts included in Class 9.—Trix Electrical Co., Ltd., 1–5, Maple Place, Tottenham Court Road, London, W.1.

KLIP-FLECTOR. No. 714,188, Class 11. Electric lighting installations and parts and fittings, all included in Class 11. —Parker & Osborn (Plate & Sheet Glass Merchants), Ltd., Scotland Street Works, Scotland Street, Birmingham, 1.

THERM-U-REG. No. 714,203, Class 11. Heating, ventilating and air-conditioning installations.—Thermo-Tanks, Ltd., 150, Helen Street, Govan, Glasgow, S.W.1.

NEW ZEALAND IMPORTS

ELECTRICAL imports into New Zealand during the first half of 1952 increased in value by over a quarter on the corresponding period of the previous year. The leading items—totalling £6,600,000—are shown in the accompanying table, with notes of increases or decreases, the latter being negligible. Figures showing the supplying countries are not yet available.

Class of Goods	Six months to June 1952 £ (000)	Inc. or dec. on 1951 £ (000)
Batteries and cells	86	+ 52
Electrodes and carbons	46	+ 29
Generators and magnetos	297	+ 118
Cable and wire	1,456	+ 401
Insulators and parts	108	+ 52
Lamp bulbs	159	+ 109
Lamps (not surgical)	448	+ 319
Motors under 1 h.p.	370	+ 56
Ditto, 1–25 h.p.	194	+ 56
Ditto, exceeding 25 h.p.	48	— 9
Motor parts, starters, etc.	115	+ 53
Electric razors	83	+ 57
Telegraph and telephone apparatus	800	+ 233
Transformers and convertors	256	+ 2
Other elec. apparatus	1,473	+ 68
Radio apparatus:		
Valves for receiving sets	216	+ 110
Other valves	29	— 1
Other apparatus	247	+ 85
Vacuum cleaners and parts	143	+ 64

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — BRISBANE. — 13th May. State Electricity Commission of Queensland. L.v. switchgear for the Capricornia Regional Electricity Board. (C.R.E. 7947/53. Ten/5847.)*

MELBOURNE.—8th April. Victorian Railways. Supply of 320,000 electric lamps. (C.R.E. 7135/53. Ten/5876.)*

Formosa. — TAIPEI. — 10th April. Central Trust of China. Electric motors, etc. (C.R.E. 7800/53. Ten/5887.)*

Gosforth. — 31st March. U.D.C. Street lighting equipment. (See this issue.)

Isle of Ely.—28th March. County Council. Electrical equipment, including wiring, fires, wireless sets and extension loud-speakers, for old people's homes now in course of erection at March and Ely. R. F. G. Thurlow, clerk, County Hall, March.

Litherland.—30th March. U.D.C. Street lighting equipment. (See this issue.)

Newcastle-on-Tyne.—1st April. Education Committee. Electrical installation in connection with a scheme for converting Jesmond Dene House into a school for subnormal girls. City architect (Education Section), 18, Cloth Market.

New Windsor.—27th March. Borough Council. Electrical installations in forty-four flats on the Manor Farm site, Clewer Hill Road. Borough surveyor, Kipling Building, Alma Road.

New Zealand.—WELLINGTON.—23rd June. State Hydro-Electric Commission. Two 30,000 kVA 110/33 kV transformer banks and spare units for Henderson and Albany substations. (C.R.E. 7960/53. Ten/5862.)*

Northern Ireland. — LONDONDERRY. — 28th March. Tuberculosis Authority. Electrical installations and alterations to existing l.v. overhead service mains at Chest Hospital. W. & M. Given, architects, 1, Waterside, Coleraine.

Rochester. — 28th March. City Council. Street lighting equipment. City surveyor, 66, Maidstone Road.

Southport. — 11th April. Corporation. Street lighting equipment. (See this issue.)

Turkey. — IZMIR. — 16th March. Municipal Public Utility Services. Supply of 20 km of submarine h.v. and 1.5 km of submarine l.v. cable. 20th April. Extension material. 15th May. Ten complete transformer stations and six transformers. (C.R.E. 7948/53. Ten/5865.)*

Uruguay. — MONTEVIDEO. — 26th March. Usinas Electricas y Telefonos del Estado. Equipment and accessories for suspension-type insulator strings. (C.R.E. 7606/53. Ten/5893.)* 21st April. Incandescent electric lamps. (C.R.E. E631/53. Ten/5886.)*

ORDERS PLACED

Barrow-in-Furness.—Housing Committee. Recommended. Electrical installations in 135 houses on the Ormsgill estate extension (£3,998). —North Western Electricity Board.

Blackpool.—Highways Committee. Equipment for street lighting improvements: 25ft pre-stressed spun concrete columns (£3,420).—Stanton Ironworks Co., Ltd.; Group "A" side-entry lanterns (£1,845).—General Electric Co., Ltd.; and 400 W chokes and 15 μF capacitors (£1,045).—Alfred Williams & Son (175 in each case). Supply of time switches (£3,325).—Sangamo Weston, Ltd.

Caterham & Warlingham.—Housing Committee. Recommended. Installation of electricity in 8 houses at Woldingham and 22 at Sunnybank, Warlingham (£910).—Purley Electrical Co.

Maidstone.—Housing Committee. Rewiring and replacement of electrical fittings in forty-three Council houses in Cherry Orchard Way (£1,310).—A. J. Horton.

Newcastle-on-Tyne. — Regional Hospital Board. Installation of a lift at Fleming Memorial Hospital (£4,764).—Pickerings, Ltd.

Tynemouth. — Town Council. Electrical work in 44 flats under construction at Redburn View, North Shields.—F. Gray.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bellshill (Lanarkshire). — Additions to General Hospital (£65,000); Forbes Murison, 64, West Regent Street, Glasgow, C.2.

Birkenhead.—Stage 1 of Fender Primary School; Morrison & Sons, Ltd., Grange Terrace, Liverpool.

Bletchley.—School at Water Eaton, for Bucks C.C.; county architect, County Offices. Aylesbury.

Border.—Houses at Low Crosby (14), Great Orton (10) and Burgh by Sands (2); R.D.C. engineer and surveyor, 5/7, Victoria Place, Carlisle.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Brighton.—Dwellings, South Woodingdean estate (76) and Hollingdean estate (13); Knight Bros. (Brighton), Ltd.

Bristol.—Scheme for reconstruction of central shopping area, in three stages; city engineer, Bath Road, Brislington, 4.

Chorleywood.—Houses (84), Berry Lane; L. C. Powell, architect, Norfolk House, Station Road, Chesham.

Clevedon.—Houses (48); U.D.C. surveyor.

Coventry.—Dwellings (219), Manor House estate; Pite, Son & Fairweather, architects, 6, Queen Anne's Gate, S.W.1.

Dover.—Three-storey business premises at Cannon Street and Market Street corner, for Montague Burton, Ltd.; N. Martin, staff architect, Hudson Road Mills, Leeds.

Dumbarton.—Houses (108), on sites in the Cardross Road area; burgh surveyor, Municipal Buildings.

Durham.—Additions to Walmorth Castle Residential School (£49,000); L. W. Ryder, Ltd., builders, Skinnergate, Darlington.

Eastbourne.—Houses (80), Langney Village estate; borough engineer.

Eastcote (Middlesex). — Houses (66), Whitby Road; surveyor to Ruislip-Northwood U.D.C., Council Offices, Oaklands Gate, Northwood.

Gateshead. — Proposed welfare centre at Carr Hill (£11,000); chief architect's department, Municipal Buildings, Gateshead.

Multi-storey flats in units of 48 in three areas; borough architect, Town Hall.

Hampshire.—Fire stations at Beaulieu and Kingsclere; county architect, The Castle, Winchester.

Harrogate.—Flats (24), Grove House estate; Baildon Development Co., Ltd., Harrogate.

Heston.—Houses (57), North Hyde Lane, for British Airways Staff Housing Society, Ltd.; F. Greenwood, surveyor, 25, Liverpool Road, Kingston-on-Thames.

Hexham.—New council chamber for the R.D.C.; W. Dixon & Son, architects, 1, Collingwood Street, Newcastle-on-Tyne.

Holyhead.—Voluntary school; L. C. Wakeman & Partners, quantity surveyors, Grove Chambers, Bangor Street, Caernarvon.

Huyton-with-Roby. — Erection of St. Dominic's R.C. Secondary School; C. J. Doyle & Sons, Ltd., Henry Street, Liverpool.

Leamington Spa.—Factory, Trading estate; Hobbs Transmission, Ltd., 78, Russell Terrace.

Leicester.—Shopping centre at New Parks estate; Symington, Prince & Pike, 1, De Montfort Square.

Temporary infants' school, Eyres Monsell estate (£14,475); City architect.

Liverpool.—Factory at 227, Edge Lane for Dellagana & Denby, Ltd.; Sir A. E. Shennan, architect, 17, North John Street.

London.—HAMPSTEAD.—Flats (96) and maisonnettes (12), Broadhurst Gardens; Richard Nickson, architect, 33/34, Welbeck Street, W.1.

WESTMINSTER.—Reconstruction for offices, Park Lane and Dunraven Street; Holland & Hannen and Cubitts, Ltd., 1, Queen Anne's Gate, S.W.1.

Longbenton.—Houses (28), Grange estate, for U.D.C.; A. E. Sweetman, surveyor, Council Offices, Forest Hall, Newcastle-on-Tyne.

Lowestoft.—Cold storage buildings; Herring Industries, Ltd., Whapload Road.

Market Harborough.—Houses (90), and a community centre on Southern estate; Council's architect and surveyor.

Neath.—Pithead baths and medical treatment centre, Rhigos Colliery; National Coal Board, Cambrian Buildings, Mount Stuart Square, Cardiff.

Newcastle-under-Lyme. — Houses (450), Crackley Bank; C. B. Parkes, architect, Bournville Estate Office, Birmingham.

North Riding.—Children's home at Thornaby; county architect, County Hall, Northallerton.

Northumberland. — Secondary modern school at Newburn; A. H. Davis & Partner, quantity surveyors, 28, Osborne Road, Newcastle-on-Tyne.

Fire station at Bellingham; county architect, County Hall, Newcastle-on-Tyne.

Norton-Radstock. — Houses (149), Westfield site; U.D.C. surveyor, Council Offices, Midsomer Norton.

Portsmouth.—Flats (80), Ling Road, Wymering; A. E. Cogswell & Son, architects, Prudential Buildings, Commercial Road.

Southampton.—School at Tanners Brook; Milne & Underhill, architects to B.C., 203, South End Road, Hampstead.

South Shields.—Houses (56), Sime Street; borough engineer.

Stourport (Worcs).—Dwellings (72), Walshes Farm estate; U.D.C. surveyor, New Street.

Spalding (Lincs).—New offices for R.D.C. (£27,000); Council's architect.

Stoke-on-Trent.—Museum and art gallery; Bell Pottery site; W. A. Bott, borough surveyor.

Sunderland.—Aged peoples' hostel at Pennywell (£30,000); borough architect, Grange House, Stockton Road.

Community Centre, Springwell (£50,000); borough architect.

Swansea.—Showroom and offices, Oxford Street; Currys, Ltd., 77, Uxbridge Road, London, W.5.

Tow Law (Durham). — Houses (100); U.D.C. surveyor.

Tweedmouth.—Canning factory; J. Van Smirren & Co., Ltd., Boston, Lincs.

West Molesey.—Houses (30), on Faraday Road estate; F. Edwards, clerk to Esher U.D.C., Esher, Surrey.

Windsor.—Flats (56) at Clewer New Town; borough surveyor.

Wingerworth.—Houses (1,500—2,000), Ledgate estate; John Adlington, Ltd., builders, Clay Cross, Derbyshire.

Wolverhampton. — Flats (156), Meridale Road; A. F. R. Godfrey & Co., Ltd., 46, Waterloo Road, Wolverhampton.